THIRD SERIES VOL 63 NUMBER 6 APRIL 1956

66 PORTLAND PLACE LONDON W1 · TWO SHILLINGS AND SIXPENCE

Liverpool Overhead Railway. Opened in 1893. From a drawing by J. L. Berbiers [A]

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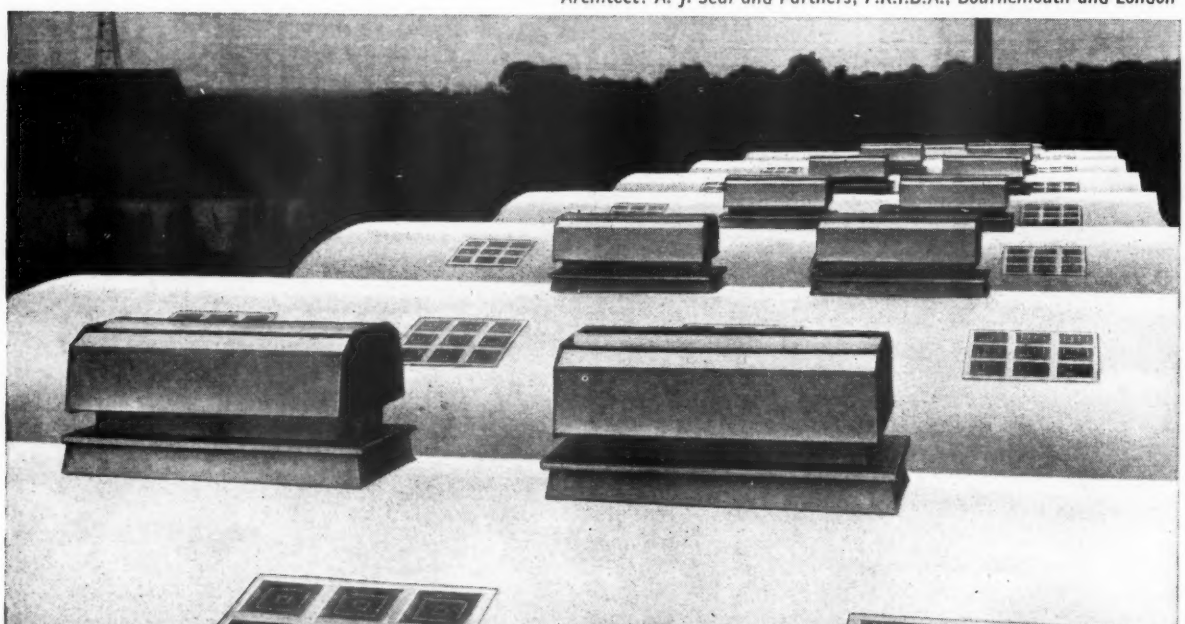

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THE JOURNAL OF THE ROYAL INSTITUTE OF BRITISH ARCHITECTS

THIRD SERIES VOLUME SIXTY-THREE NUMBER SIX TWO SHILLINGS AND SIXPENCE
66 PORTLAND PLACE LONDON W1 TELEPHONE LANGHAM 5721-7 TELEGRAMS: RIBAZO WESDO LONDON

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Associate of the Royal Scottish Academy

Mr. A. Esme Gordon [*F*] has been elected an Associate of the Royal Scottish Academy.

Undertaking of Private Work by Local Authority Architects

The Council have been considering the principles involved in the undertaking of work for private clients by the official architectural departments of local authorities. It is the opinion of the Council that each case must be judged on its individual merits, but in general it would only be considered appropriate for an official architectural department of a local authority to undertake work where that local authority has a financial or operational responsibility for the completed work, or where a substantial proportion of the cost of the work is chargeable against public funds through the local authority.

The Building Centre Annual Luncheon

Sir Giles Gilbert Scott, O.M., R.A. [*F*], Chairman of the Building Centre, presided at the annual luncheon held at Claridge's Hotel on 4 April. The luncheon is an occasion when the Building Centre entertains members of its council, government officials, senior research officers, representatives of the principal nationalised industries and trade associations and the editors of the architectural periodicals. The lunch is invariably a good one and there are no speeches except, this year, a short and graceful speech of thanks on behalf of the guests by the President R.I.B.A., Mr. C. H. Aslin, C.B.E.

The lunch is also the occasion when the Director, Mr. F. R. Yerbury, O.B.E. [*Hon. A*], presents his report for the past year. This he does by providing everyone present with a brief, duplicated document. From it we gather that the Building Centre continues to flourish. The number of enquiries has increased from 97,257 to 103,159 and 300,000 information sheets have been issued on behalf of exhibitors. Upwards of 2,000 manufacturers are represented, many of them in group exhibits organised by trade associations.

In addition to its numerous lectures, visits, trade demonstrations, film shows and exhibitions, the Centre's most ambitious effort during the past year was a four-month exhibition of examples of selected apprentices' work organised by the London schools of building with the assistance of the London Master Builders Association. Produced and financed by the Building Centre, it aimed at encouraging apprenticeship entries to the industry and it is believed to have had most successful results.

Forthcoming Exhibition: Hemel Hempstead

An exhibition arranged by the Hemel Hempstead New Town Development Corporation is to be on show in the Henry Florence Hall between 22 and 30 May. Designed to show the progress of the new town so far, it will illustrate the work of some 50 private architects in addition to that of the architects of the Development Corporation. All the drawings have been specially made for the exhibition and there is to be a new model of the town centre as well as other models.

The President R.I.B.A., Mr. C. H. Aslin, C.B.E., is to open the exhibition on 22 May and the public will be admitted from 2 p.m. onwards. It will be open daily from 10 a.m. to 7 p.m., Saturday 10 to 5.

This exhibition, the first comprehensive review in pictorial form of progress in one of Britain's new towns, is likely to arouse considerable attention among architects and those lay persons who are interested in housing development in general. One can assume that progress in the other new towns has been similar; the visitor to the exhibition will therefore get a good idea of the extent to which this important movement—perhaps the most exciting element in present day British housing—is developing.

S.P.A.B. Course on the Repair of Ancient Buildings

The Society for the Protection of Ancient Buildings is holding its annual course on the repair of ancient buildings from 7 to 12 May. The course provides facilities for architects and surveyors interested in and responsible for old buildings to obtain information on this subject; it will consist of lectures, visits and discussions to cover the many important aspects of repair work. Not only is the scope of the course wide, but a two-day coach tour to buildings which are under repair or have been repaired is a pleasurable and instructive element in it. Full particulars can be obtained from the Secretary, The Society for the Protection of Ancient Buildings, 55 Great Ormond Street, W.C.1.

The Society is anxious to secure that those dealing with old buildings should understand not only traditional constructional methods but also the principles underlying the sympathetic and conservative treatment of old buildings, whether ecclesiastical or secular. In view of the specialist nature of work of this character, the Society believes that the opportunity to study at first hand some of the problems which arise will be helpful to architects interested in this subject. It is hoped that local authorities and others will be able to give facilities to the architect members of their staff to take advantage of this scheme.

International Union of Architects

The Schools Construction Committee of the I.U.A. met at the R.I.B.A. on 20 March. The meeting, which lasted for three days, was devoted mainly to consolidating the Commission's current inquiry into school buildings generally and to considering how the experience and information obtained could best be adapted for the benefit of the less developed countries. Representatives attended from France, Holland, Sweden, Great Britain, Czechoslovakia, Switzerland, Morocco, Yugoslavia, Germany, the United States, Lebanon, Tunisia, Italy, Belgium and Poland.

During their stay in London the delegates dined at the R.I.B.A., where they were entertained by the President, Mr. C. H. Aslin, C.B.E., who was formerly a member of the Commission. Professor Robert Matthew, C.B.E. [*F*], Chairman of the United Kingdom Committee of the I.U.A. was also present.

The delegates also attended cocktail parties at the R.I.B.A. and at the Architectural Press and visited schools in London and Hertfordshire. An account of the meetings by the United Kingdom delegate will appear in next month's JOURNAL.

City and Borough Architects' Society

Mr. Leonard C. Howitt [*F*], who has been President of the City and Borough Architects' Society for the past eight years, has retired from that office. At the recent Annual General Meeting of the Society Mr. A. G. Sheppard Fidler [*F*], City Architect, Birmingham, was elected President, and Mr. T. E. North, O.B.E. [*F*], Borough Architect, West Ham, was elected Vice-President in succession to Mr. C. C. Shaw [*F*], who retired for health reasons.

The York Institute of Architectural Study

The Minister of Works, the Rt. Hon. Patrick Buchan-Hepburn, M.P., opened on 16 March the new headquarters of the York Institute of Architectural Study. The building was illustrated and an account given of the work of the Institute in the JOURNAL of August 1955. The Minister congratulated Dr. W. A. Singleton [*F*], Director of the Institute, on its remarkable development and the York Academic Trust and the City of York on their support of it. It was, he said, an exciting venture which set out to study, in post-graduate courses, many aspects of the past, present, and future of architecture. We could not dispense with an understanding of the past which, like contemporary architecture, was a natural evolution arising from the needs and materials of the time; he was glad that 'pseudo' architecture was in decline. Public appreciation of architecture was more than ever important to-day; he felt that no other country, through well-meaning ignorance, had done more than Britain to spoil its towns and countryside with unworthy building. Finally, he urged the need for attaining unity today in the building team. These three aims were well covered in the comprehensive field of study of the Institute.

Dr. Singleton thanked the many firms, societies, institutions and individuals who had helped with funds and equipment for the building. The work of converting the old church had been remarkably well done and a very high standard of craftsmanship had been achieved. Reporting on the various courses, both held and projected, he said they were leading up to the establishment of the first full-time post-graduate institute of architectural study.

The opening ceremony was held at the Assembly Rooms in the presence of a distinguished company which included the Lord Mayor of York, the Dean of York and the Sheriff of York. It was preceded by a luncheon at the Mansion House and followed by an inspection of the new headquarters and tea at St. Anthony's Hall. In the evening a dinner was given in the Assembly Rooms by the contractors, Messrs. W. J. Furse and Co., after which a party was held in the Treasurer's House for lecturers, former members of courses and others. During the afternoon a special team of ringers performed on the Institute's peal of six bells, the oldest of which is dated 1408.

R.I.B.A. Secretary for Professional Relations: New Appointment

The Royal Institute of British Architects invites applications for the appointment of Secretary for Professional Relations, to initiate and conduct research into the organisation, function and employment of architects. Applicants for the appointment will be required to show that they are experienced in similar undertakings, and that they have general administrative ability, practical knowledge of statistics and analysis of factual information, and competence to summarise and present the results obtained for the guidance of the R.I.B.A. Council and Committees.

Starting salary £2,000 (may be higher if qualifications exceptional) rising by annual increments of £100 to £2,500 per annum.

Further information and application form may be obtained on request from the Secretary, R.I.B.A., 66 Portland Place, W.1. Closing date 12 May 1956.

Section A.A. Theatre Group

Since its formation in 1953 as a body of architect amateur actors, Section A.A. Theatre Group has presented six plays selected because they are considered to be of more than average interest but which are rarely performed on the professional stage. Their latest venture, at the Twentieth Century Theatre, Notting Hill Gate, in March, was Anton Chekhov's *The Three Sisters*.

Originally most of the members of Section A.A. were students or former students of the Architectural Association School who had started putting on plays at the A.A. soon after the last war. Now the membership is much broader, although the close association with the A.A. is carefully maintained. In many ways it is interesting to compare the Group's activities with those of the pre-war Architect Players, several of whose members are now regular supporters of the younger group.

If the Group is to continue its work it will have to increase its audience, for with each succeeding production costs have risen appreciably and as they are not subsidised all losses have to be carried by the individual members.

Perhaps for their next production, which will probably be in the autumn, more members of the R.I.B.A. will give their support by buying tickets. Each show is carefully designed by the Group, the members of which take a pride in the fact that all the sets, tickets, programmes, etc., are their own work.

Mr. Musman's Exhibition

The President, Mr. C. H. Aslin, C.B.E., opening the exhibition of paintings and drawings by Mr. E. B. Musman [*F*] at Parsons Gallery, 70 Grosvenor Street, drew attention to the wide range of the work on view. In method this covered oil painting, watercolour, crayon, ink and pencil and, in subject, architecture, landscape, industry in action, boats and air raids in progress. The President said he hoped that architects would make a point of visiting the exhibition because it was in aid of the Architects' Benevolent Society (the exhibition closes on 25 April).

R.I.B.A. Diary

TUESDAY 1 MAY. 6 p.m. Special General Meeting. Annual General Meeting.

TUESDAY 15 MAY. 6 p.m. General Meeting. *Architecture and the Local Community*—Henry Morris, C.B.E. [*Hon. A*].

SATURDAY 19 MAY–MONDAY 21 MAY inclusive. R.I.B.A. offices and library closed for Whitsun holiday.

TUESDAY 22 MAY–WEDNESDAY 30 MAY inclusive. Hemel Hempstead New Town Exhibition. Mon. to Fri. 10 a.m.–7 p.m. Sat. 10 a.m.–5 p.m.

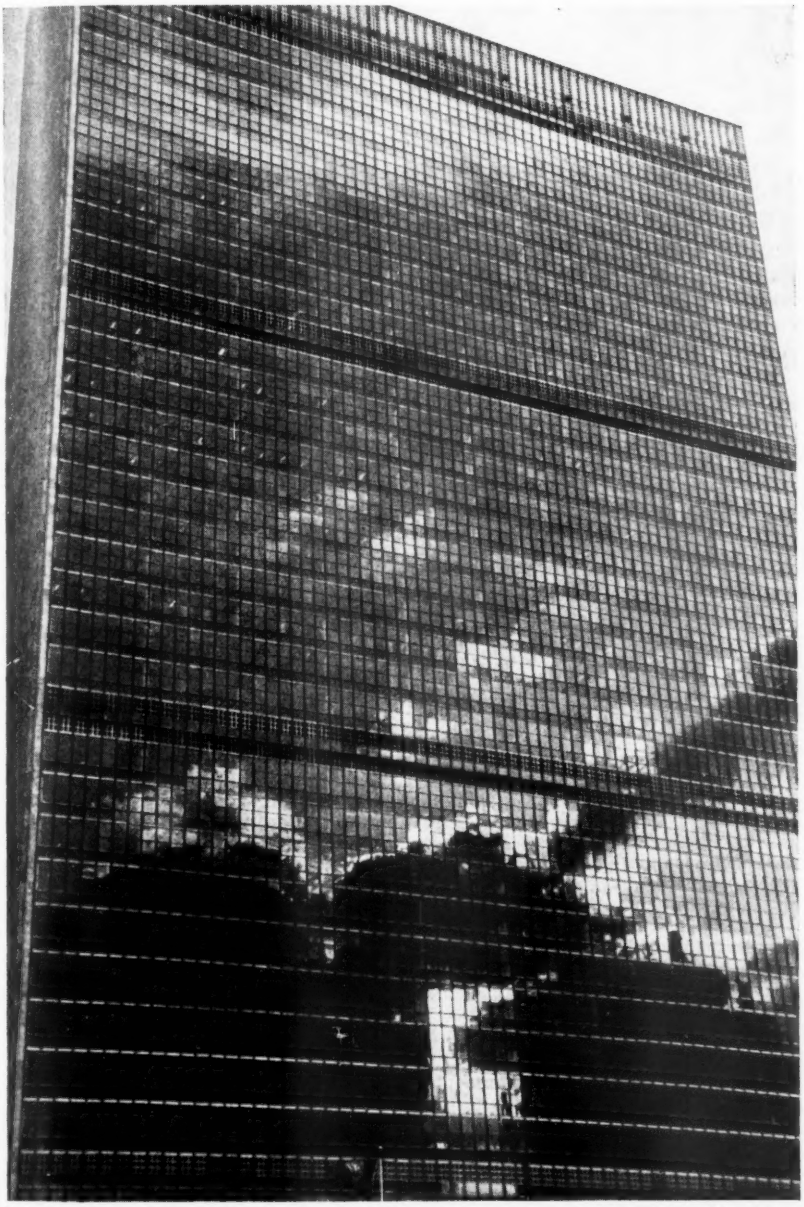
WEDNESDAY 30 MAY–SATURDAY 2 JUNE inclusive. British Architects' Conference 1956 at Norwich.

The Cladding of Buildings

By Edward D. Mills [*F*]

Read at the R.I.B.A. 20 March 1956

Mr. W. A. Allen [*A*] in the Chair

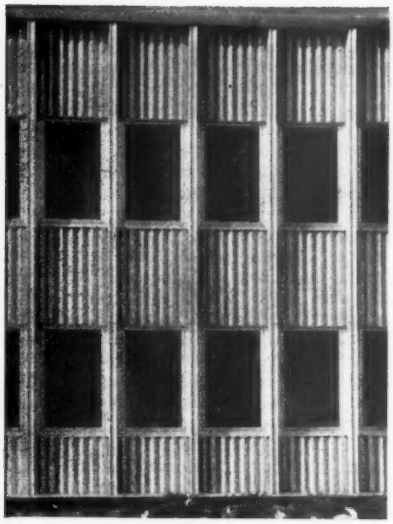


United Nations Secretariat, New York. Architects: Harrison and Abramovitz. Aluminium curtain wall with heat-absorbing glass infill

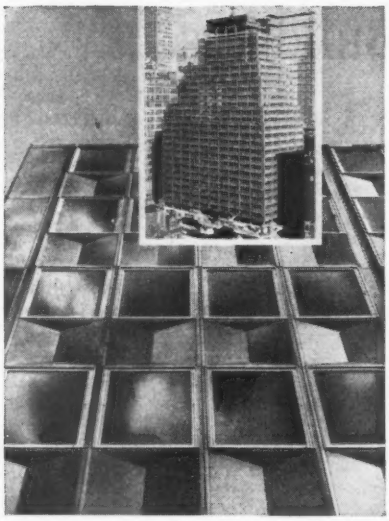
WITH THE ADVENT OF THE FRAMED STRUCTURE in steel or reinforced concrete, the cladding of buildings has assumed a new importance. When buildings relied upon their external walls for structural stability and the loads of floors and roof were carried by the external walls, the range of materials for this purpose was limited to those which not only provided a weatherproof exterior of good appearance, but also possessed sufficient strength to carry the calculated loads. With the development of the framed building the external cladding became non-structural, because loads were carried not by the walling but by the framework. In spite of this new freedom few of the earlier framed buildings employed a non-structural cladding and the traditional materials of brick and stone were used in the traditional manner in spite of the fact that their primary function was protection against weather. Even today the vast majority of framed buildings are clad with walls of brick or stone which are considerably stronger than they need be, and which add very considerably to the load to be carried by the building framework and foundations.

The development of new cladding techniques and the general appreciation of the advantages to be gained from lighter cladding have made the range of materials available for this purpose very much greater. Not only are new materials available but experiments have shown that traditional materials can be used in new ways, so that their special merits can be exploited. Before reviewing some of the more important cladding techniques and materials it is essential that the functional requirements of the cladding to a framed building should be briefly considered. We have already seen that structural strength is of less importance in the cladding of a framed building than other characteristics, but it must be remembered that traditional, load-bearing walls, because of their thickness, usually automatically solved many of the problems such as weather resistance, permanence and freedom from thermal movement that we encounter with lighter non-structural claddings. With non-load-bearing claddings one of the primary problems is weather resistance, particularly in tall buildings exposed to the elements. The prevention of moisture through the external walls of any building is always a problem of importance. When we consider the fact that a heavy rainstorm will give a water run-off from a building with an impervious surfacing of something in the region of one gallon of water per foot run per storey height per minute, or anything from 3 to 4 thousand gallons per minute on a 25-storey high building of reasonable size, the extent of the problem can be easily visualised. If a building is not faced with an absorbent material which can take up some of this moisture and lose it later by evaporation, the full burden of this moisture is placed upon the joints of the cladding system. If we have an impermeable surface we need a perfect joint, which is difficult both to make and to maintain.

Joints in any cladding system are a troublesome problem, for thermal and structural movement can cause change of size in the unit members and open up paths for moisture penetration. If no special precautions are taken, movement of 1 in. in 150 ft. can be expected as between summer high temperatures and winter low ones, and if we do not provide for such expansion Nature will deal with the matter for us. On a tall building tem-



Alcoa District Sales Office Building, Cincinnati, U.S.A. Architect: Paul Schell. Curtain wall of coloured corrugated aluminium



Aluminium storey height panel cladding to office building, New York. Architect: Emery Roth

Mayo Clinic, Rochester, Minnesota. Architects: Ellerbe & Co. Corrugated aluminium extrusion spandril panels

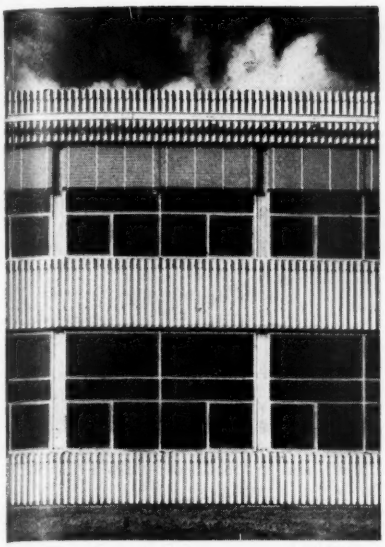
perature differences between the top and bottom storeys will further complicate the issue; for example, the temperature at the top of the Empire State Building, New York, averages from 3 to 9 degrees lower than that at street level, with a maximum recorded difference of 24 degrees. Admittedly this is the tallest building in the world—1,250 ft. high excluding the 222 ft. television mast—but lower buildings will still have this problem to a lesser degree. With a vulnerable jointing system wind pressure can also facilitate moisture penetration. To quote the Empire State Building again, at the top 60–80 m.p.h. wind speeds are common with a record of 125 m.p.h. On lower buildings on exposed sites this factor has led to trouble, the outstanding example being the United Nations Secretariat—40 storeys, 554 ft. high—where driving rain forced by high winds travelled up the unabsorbent face of the building, forcing its way through weepholes and past drips designed to carry water away on its normal downward flow.

Higher heating standards in modern buildings demand better thermal insulation for the sake of economy, and if our non-traditional cladding materials do not have a low thermal capacity in themselves, insulation must be provided as an integral part of any cladding system or be closely related to it. One problem is the fact that high insulation levels often seem to produce condensation, and warm humid air from the inside of a building which finds its way into a cold unventilated cavity will condense on the cold inner surface of an impervious metal or glass cladding material. With an absorbent cladding or one faced with an absorbent material the moisture can distribute itself in the pores of the material and evaporate out harmlessly. Alternatively a vapour barrier can be incorporated in an inner lining to prevent the humid air from reaching the cold surface.

With any form of cladding, fire protection and the reduction of the risk of fire spread is a matter of importance. Bye-laws and building regulations specify from 1 to 4 hours' fire resistance for external walls of buildings, depending on the position of the structure and its intended use. Most authorities will accept a 3 ft. high fire protection back-up wall behind a cladding with a low fire resistance, or alternatively a projecting nib of 3 ft. girth at each floor level to form a fire break between floors. This latter solution has certain advantages which will be mentioned later, but it automatically reduces the possibility of continuous cladding. It does however facilitate the use of certain types of storey height panel.

The accumulation of grime and the gradual discoloration of many traditional buildings in a comparatively short time, particularly those in our polluted city atmosphere, is often politely referred to as 'natural weathering', and on some buildings this kindly action of the elements, gradually obliterating the architect's cruder details, is to be welcomed. With non-traditional materials this action of smoke, weather and time cannot be so easily explained away; it is obvious to all as deterioration and decay, resulting often in physical breakdown and failure. Materials chosen therefore for the forms of non-traditional cladding we are discussing must be permanent both in colour and texture and where they can collect dirt and grime they must be capable of easy cleaning and maintenance. If a high building cannot be maintained easily it will be neglected, with discouraging results. This problem is of particular importance in the case of buildings clad with metal or glass, where accumulated dirt is easily seen. It is essential that facilities for cleaning and repair to such buildings should be incorporated as part of the structure. The permanent cleaning gantry designed for the United Nations Secretariat building was ultimately omitted on economy grounds, and even regular maintenance jobs such as window cleaning must be carried out in the 'traditional' but extremely hazardous manner. The window cleaner sits on the sill of the window restrained by his safety belt hooked on to buttons on the window mullions. The United Nations cleaning gantry was used on the Lever Building, New York, and the entire face of the building can be cleaned in relative comfort in 116 man-hours. This work is carried out regularly and the perpetually clean and sparkling appearance of this building is due in no small measure to the ease with which it can be thus maintained. Buildings using this type of cladding material must be serviced in this way, and it is of interest to note that at least one recent building in this country, the L.C.C. comprehensive school at Putney, is fitted with a permanent cradle rail for window cleaning and maintenance work. The projecting nib fire-break mentioned earlier offers another method of access for cleaning and repair, for although it is usually limited in width on medium height buildings, it does provide a reasonable foothold for window cleaners.

The permanent concern of architects and clients is the ever-rising cost of buildings and the length of time needed for their completion. The cladding used for a building can influence the cost to a considerable degree. We are continually being reminded, and rightly so, that the conventional 11-in. cavity wall costs in the region of 5*s*. to 6*s*. per sq. ft. If alternative non-traditional cladding techniques are to become a permanent feature of our architecture, the question of cost must be tackled seriously. This is where manufacturers can help and where early collaboration between designer and manufacturer can produce useful results. On the credit side lighter wall claddings require



Asbestos Cement factory near Heidelberg. Architect: Dr. Ernst Neufert. Corrugated asbestos cement cladding

less framing material and lighter foundations and are easier to erect. On the Aluminum Company of America's office building in Pittsburg, U.S.A., the use of an aluminium panel cladding reduced the weight of the structural steel frame to half that of a conventionally clad building, giving a saving of 10,000 tons of steel. The timber and glass cladding to the Gordon McKay physics laboratory block at Harvard University showed a saving of 50,000 dollars (nearly £18,000) over the normal brick spandril wall with metal window glazing, and similar experiences in this country could be quoted.

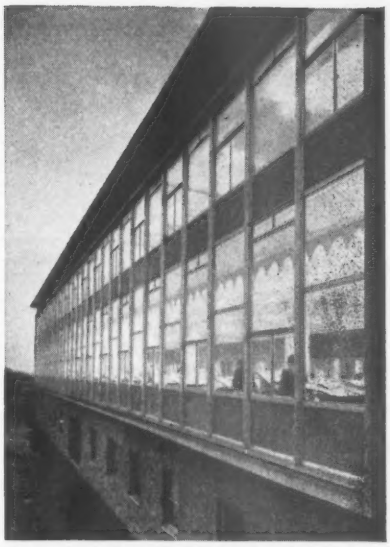
Speed of building and the reduction of site labour is also of great importance and here again non-traditional cladding can show useful results. The precast concrete panel cladding systems originally devised by the Hertfordshire County Council's architect played an important part in the speedy erection of that authority's schools, being appreciably quicker than normal brickwork. The aluminium cladding system on a recent New York office block of 26 storeys in height, using 1,800 panel units, was completed in 6½ days, resulting in valuable savings in labour costs and an earlier rent return.

Non-traditional claddings usually have a lesser overall thickness than traditional claddings, and on a multi-storey building this can mean a surprising addition to the usable floor area; for example, if a 20-storey building 100 ft. long by 30 ft. deep has 6-in. thick external walls instead of 12-in. walls, a net gain of some 3,200 sq. ft. of floor area is achieved (an addition of over 5 per cent) on the same size building plot, a matter of some consequence with floor space let at £2 per sq. ft. It can readily be seen therefore that non-traditional claddings have their material benefits as well as their practical problems. Admittedly the latter must be solved if the former are to be enjoyed.

Cladding of the kind under discussion must necessarily have a considerable influence on the aesthetics of our buildings. Traditional styles and forms cannot be successfully duplicated in structures clad in precast panels, metal panels, sheet materials or curtain walls of metal and glass. The non-structural nature of the cladding employed must of necessity be expressed in the architectural form of the building, whether the cladding is in the form of an 'overcoat' wrapped around the structural frame, a panel system from floor to floor, or a non-structural infill to a cellular box frame. Great care is needed in the design of buildings of this nature, quite apart from the need for careful solutions to technical problems. A whole street of Lever Buildings could become monotonous, and the building which may look superb through the lens of the ARCHITECTURAL REVIEW photographer's camera in the right sort of weather is sometimes merely dull when the sun is not shining from the right quarter. We must give thought not only to colour and texture in our building claddings, but also to scale, pattern, contrast and bold modelling of the building and its elements. This is particularly true where large, tall blocks are concerned and where there is a strong temptation towards the smooth unbroken slab such as the United Nations building, which demands some form of large-scale modelling, for instance, on the roof line. Mies van der Rohe's steel and glass apartment towers in Chicago, on the other hand, with their strong pattern of heavy steel mullions, create their own detailed interest and have a remarkable and unique architectural character. The non-structural nature of these mullions can be clearly seen when their method of erection is understood.

Leaving these general comments which concern, at least in part, all forms of non-traditional wall cladding, it is essential that the three main lines of development in the cladding of buildings should be considered in greater detail. For the purpose of this paper I have narrowed the field to three major categories: *Heavy Claddings*—stone slabs, precast concrete slabs, concrete sandwich slabs and concrete storey height panels; *Light Claddings*, including the various types of curtain wall and light storey height panels, and *Sheet Claddings*—the smallest group, including asbestos cement, plastics and various sheet metals.

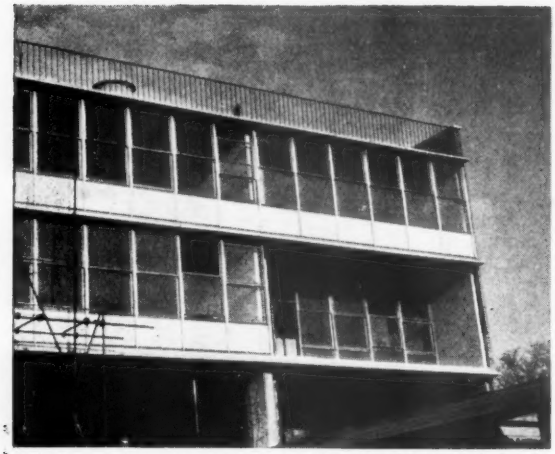
Heavy Claddings. Natural stone is one of man's oldest building materials. From early times until the present its attractive appearance, enduring qualities and strength have made it an essential part of our architectural heritage. Even with the development of the non-load-bearing wall it has continued to be used as a walling material as an outer skin bonded to a cheaper backing of brick or concrete. The rising cost of quarrying, transport and building labour, together with the weight



Office for Mitchell Engineering Ltd., Peterborough. Architects: Howard V. Lobb and Partners. Aluminium curtain wall with riven slate infilling panels

and slowness of traditional stone construction, is however rapidly forcing it out of the category of economic building materials. If it is to retain a place as a cladding for contemporary buildings, new ways must be found of employing it. As a thin slab cladding, natural stone still has a considerable future, as a number of Continental buildings prove. The technique normally employed entails the cramping of thin stone slabs 1½–2½ in. thick to a brick or concrete backing wall. Where a non-absorbent stone is used, the whole burden of rain falling on the face of the slab is taken by the joints, the moisture drawn by capillary action into the space between the slabs and the backing wall, where it may run down and find its way out lower down the building or seep through the inner lining. This suggests a perfect joint or an absorbent slab, the latter being more easy to achieve than the former. Moisture penetration of this sort can have disastrous results, particularly in severe cold weather.

On the Congress Hall at Zürich large-scale failure of the stone facing slabs took place as a result of moisture entering through the joints of the travertine marble facing slabs and the consequent freezing or the thermal movement at a time of extreme winter temperature change caused a failure of the metal cramps. Denzil Nield reports this in his 1949 Bossom Report and states that some of the slabs were 3 ft. by 7 ft. and only 1 in. thick with two cramps at the bottom and top of each slab. The thinness of the slabs limited the size of the cramps, and they were incapable of supporting any load greater than the slabs they held individually. A single failure therefore had a cumulative effect, and a large area of facing fell off as the result of failure at a few fixing points. The logical solution would appear to be the intro-



Quintin and Kynaston Schools, London. Architects: Edward D. Mills and Partners. Storey height Canadian red cedar cladding panels with ply-glass infilling. Concrete fire stop nibs at floor level

Pressed metal curtain wall to Oxford Street store. Architects: Robinson and Bull. Infill of metal windows and coloured ply-glass with breeze block fire protection behind

duction of additional structural support at floor and sill level to limit the possible load on the cramps. It is important too that cramps should be of rustless metal to avoid unseen corrosion and subsequent failure. A material which could undoubtedly be used in this way—as a spandril panel—is slate, which has many attractive qualities; although high in price its permanence should make it a valuable heavy cladding material. For buildings where cost is not the primary consideration slate, granite, marble and other thin stone slabs can provide a handsome and lasting cladding.

The T.U.C. Memorial Building employs 2-in. granite slabs tied back with brass cramps and corbels to concrete structural spandril walls, each slab being also fixed to the adjoining one by brass hooks. All horizontal faces are protected from moisture penetration by sills or metal flashings.

Since the war a remarkable advance has been made in the production of precast concrete cladding units, at competitive prices. Much of the credit is due to the Cement and Concrete Association, who together with the industry have carried out a great deal of research and experimental work in this field. One of the earliest examples of precast concrete cladding panels can be seen on the flats at Drancy in France, built nearly 20 years ago, where 12-in. wide tee-shaped storey height slabs are hung from a steel cladding rail. The slabs are 1¼ in. thick and are faced with white Carrara marble pebbles, which have remained, in spite of wartime neglect, in a remarkably good condition. The weakness of the system was the mastic joint filling. This system was the forerunner of many others, the best known in this country being the one first employed on the Hertfordshire County Council schools. This was originally a storey height vertical slab system, but later became a horizontal slab system. The slabs are 2½ in. thick, reduced to 1½ in. at the centre, 8 ft. 3 in. long and 1 ft. 4 in. high. The horizontal joints are tongued and grooved and the vertical joints against stanchions have draining grooves and are left open. The members are fixed to the stanchions with sherardised hook bolts. The standard finish is a white chipping, but alternative exposed aggregate finishes can be employed and moulded or texture surfaces offer considerable scope for patterning.

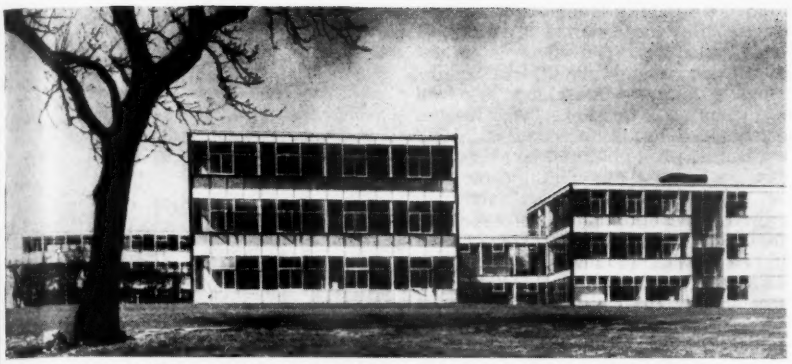
The M.O.E. school at Worthing has a precast concrete panel system of special interest, using 1½-in. thick shaped slabs 20 in. deep, with open horizontal joints through which any water penetrating the external skin may escape.

With any form of precast concrete unit the question of surfacing is very important. Once more the alternatives are a perfect joint with an impervious slab, an absorbent slab or a jointing system which drains mechanically.

One of the more recent concrete slab developments is the sandwich slab consisting of a weatherproof outer face, an insulating core and a permanent inner face, or one to which a lining can easily be fixed. In the latter case woodwool slab provides a good insulating core, and in the former lightweight concrete has been used successfully. At a factory at Eastleigh the outer surface is exposed aggregate of a pleasant pinkish colour. The slabs are storey height held in a concrete kerb at the base and a precast concrete sill at the head. They are 12 in. wide and 6 in. thick and were erected quickly with a simple crane; the finished wall was cheaper than the normal 11-in. cavity brickwork and considerably quicker in erection. M.O.E schools at Wokingham and Coventry have also used a sandwich technique.

Large storey height panels in concrete have been used in America with success, incorporating window openings in the assembly. The 550 Building in Miami has five storeys above the ground floor entirely clad in lightweight precast concrete panels with a quartzite surface. Each panel is 7 ft. 11½ in. wide by 11 ft. 5 in. high by 4 in. thick, with a 3 ft. 6 in. by 6 ft. window opening. They are bolted back to the face of each floor slab so that every panel projects 4 in. beyond the one below. ½-in. open joints are left for drainage with an aluminium check backed up with mastic to prevent water penetration. Another interesting development is the Dock Labour Board Building on the Albert Embankment, which also uses large precast concrete storey height wall-cladding units. The panels are 3 in. thick precast concrete slabs with a Portland stone face, 24 in. wide and 10 ft. high. Each panel is bolted to the structural concrete beams; a nib at the top of the panel is bolted to a projecting lip at the bottom of the beam. The panels are bolted together horizontally. The total wall thickness is 18 in., made up of the 3-in. slabs, an 11½-in. cavity which contains windbracing, and a 2½-in. inner thermal lining.

Light Cladding. Passing to light cladding, the most important development in this field has been the emergence of the curtain wall, with such buildings as the United Nations Secretariat and the Lever Building in America providing large-scale experiments. Curtain wall systems generally consist of lightweight cladding materials held back to the structural frame of the building by means of an independent framework of wood or metal. Considering first the materials available for the infilling panels, a wide range is already available, and most meet the demand that they should be tough, durable, light in weight, colourful and rigid. The list includes glass, either plain or wired; heat-absorbing glass; multi-pane glazing units, and coloured stove enamel glass; asbestos cement painted, mineral surfaced or veneered with a metal skin; resin bonded plywood, plastic sheet, stainless steel, aluminium and stove enamelled metal sheets. Glass has obvious merits, it is easily cleaned, providing the proper facilities are provided, and both the stove enamelled variety and the multi-pane units with a centre membrane of coloured glass fibre offer a wide



Patent glazing cladding to school in Yorkshire. Architects: Architects' Co-Partnership

range of textures and colours. In company with the American heat-absorbing glass, any coloured glass or glass over a coloured backing needs care in detailing. Experience has shown, particularly on the Lever Building where heat-absorbing glass was used, that such materials do absorb a considerable amount of solar heat and unless adequate glazing tolerance is allowed, widespread cracking of the panels may result in hot weather. On the Lever Building, collected solar heat also dried out the glazing mastic at an abnormal rate, causing moisture penetration. Manufacturers' recommended glazing sizes must also be scrupulously observed or failure through abnormal wind pressure may result.

An asbestos sheet veneered with silicon-treated 24 gauge embossed aluminium will be available shortly with maximum panel sizes of 4 ft. wide and 6 ft. length. The surface finish is a pleasant grey colour. Asbestos sheets can also be painted, finished with a mineral surfacing, or veneered with a vitreous enamel steel sheet. Infilling panels of porcelain enamel steel sheet on a honeycomb paper insulating core were used for the early sections of the General Motors Research Buildings, Detroit. The panels bulged when the bond between the core and the steel skin separated. The core adhered satisfactorily to plain metal, but to equalise the stresses in the sheets both sides had to be enamelled and the adhesive used was not strong enough to hold the insulating core. When insulating block was used as a core, the block disintegrated and the glue held. For the final buildings aluminium panels were used, enamelled on the outside only to avoid an inner smooth surface inadequate for glueing.

With thin stainless steel or aluminium on a suitable core, the main problem is the gauge of the metal; this buckles and distorts if it is too thin. Corrugation will help to overcome this difficulty or alternatively cast panels have adequate rigidity with increased weight. Plastic panels of cellular form filled with vermiculite concrete for fire protection, the mullions being rebated prestressed concrete members, have been employed at the I.C.I. Research Laboratories at Welwyn and at Dartford Technical College where an aluminium assembly was used. Better colours and a wider range of surface treatments would be appreciated, and in schools in Yorkshire resin-bonded plywood panels give a rich effect in contrast with the adjacent glass infillings.

This list of infill materials will undoubtedly expand during the next few years. The main problem with curtain walling still remains, the method of holding together the chosen panel material. American systems employ aluminium members, for example the U.N. Secretariat; stainless steel, Lever Building and the Bakers Institute, Chicago; steel sections, Lake Meadows, Chicago, and Harvard Physics Laboratory, timber. In this country we have a number of proprietary systems, including an aluminium mullion and transome system, a system of galvanised steel flats with aluminium cappings, which has also been used in the U.S.A., several systems built up from metal window sections, and those based on the patent glazing technique with its carefully developed arrangements for drainage. This latter technique is unknown in the U.S., but experience here suggests that it is a logical approach to the problem. Precast concrete mullion systems are popular on the Continent, but have not been widely developed here yet.

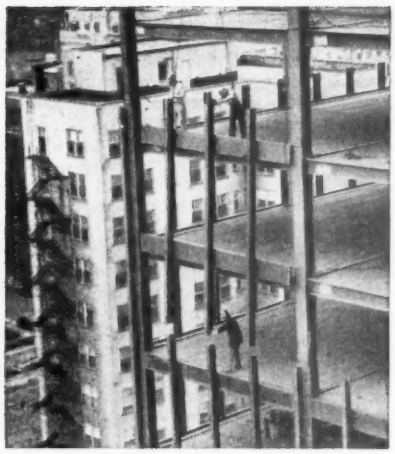
At this point a brief mention must be made of the use of mastic in curtain walls. It is unwise to assume that mastic is the answer to every jointing problem, however it is employed. It has a definite place if it is used with care and intelligence. Briefly, it should be protected from the weather to reduce oxidation, and should be considered primarily as a second line of defence. It should never be used in a load-bearing capacity and should be of adequate size to take up movement and allow for oxidation. Consultation between manufacturer and user is of vital importance. An interesting alternative jointing technique developed for the General Motors Buildings, Detroit, is the extruded neoprene gasket, rather like a car weatherstripping, which has been employed as the joint between mullions and infilling panels. The main question here concerns length of life, for natural rubber and synthetics are subject to oxidation through the action of ultra violet light. Time alone will prove the effectiveness of this technique. Generally, mechanical joints which deal with the water penetration by drainage methods are to be encouraged, with the other techniques as a second line of defence.

Timber curtain walls are beginning to appear in this country, usually specially designed by the architect of the building concerned, like the Mayfield School at Putney, consisting of a storey height timber framing unit with metal opening lights. A 4 in. clinker block fire stop lining is provided separately and spandrils are filled with ¼ in. cast glass in front of a ¼ in. stove enamel asbestos sheet. The Harvard Physics laboratory mentioned earlier is another example. Many of the problems found with metal systems seem to be absent from these timber ones.

Timber storey height panels, in western red cedar, have been used with success, are cheap to make and easy to erect. In the Quintin School in London, combined with the floor level fire stop and box frame construction, they have considerable advantages; little maintenance is needed and the double hung sash window in this instance has many good points. Of the metal storey height panels, stainless steel is being used in America, but high costs make it an unlikely material for this country. The aluminium storey panel on the Alcoa building mentioned earlier has great possibilities. It is designed for rapid erection and its jointing system which drains out any moisture seems to be foolproof. The panels employed are 6 ft. wide by 12 ft. high of ⅛ in. aluminium sheet and incorporate a pivot-hung window assembly. Erection of 30 storeys took ten men one month. The panels were designed for a wind load of 34 lb. per sq. ft. and weigh 2¼ lb. per sq. ft. With the 4-in. 'perlite' back-up wall the cladding has a 4 hr. fire rating and a 'U' value of 0·14.

Sheet Cladding. The final category of cladding which time will permit us to consider very briefly is sheet cladding. Asbestos cement sheeting fixed to cladding rails has long been an accepted industrial technique of cladding. Although a range of assorted patterns is available, what is badly needed is a coloured asbestos cement sheet with a reliable secret fixing system and a carefully detailed set of accessories for corners, sills, eaves and similar positions.

A double asbestos skin bolted to a steel frame was used at the M.O.E. school at Belper, with 3-in. precast fibrous plaster storey height inner lining panels. The system, which is based on a 3 ft. 4 in. module, is low in cost and light in weight; the 'U' value of the complete wall was 0·19. The principal disadvantage is the unpleasant 'natural' colour of the sheeting which must be painted if any alternative to the dirty grey colour is required. Such treatment will of necessity require fairly frequent renewal—thin asbestos cement also tends to get brittle with age. A number of very carefully designed German buildings have been clad with asbestos cement sheeting. The obvious economic advantages should make the production of a coloured, well-designed asbestos cement



Progress photograph of 860 Lakeshore Drive, Chicago. Architect: Mies van der Rohe

cladding system well worth while. Corrugated plastic sheet is available, but again colours are dull and uninspiring. Stainless steel and aluminium sheets are also available in the natural finished metal, which may well lose a good deal of its initial brightness after exposure to weather. American aluminium manufacturers produce brilliantly coloured fluted and corrugated material. The office building illustrated at Cincinnati has panels of gold and blue between grey mullions. In this case the window, wall and mullions were shop-assembled in one unit and anchored into place between 6 in. by 4 in. structural columns at 4-ft. centres. Fibre glass insulation was fixed behind the panels and plaster applied to metal lathing on furring channels. The total wall weighed less than 13 lb. per sq. ft. with a 'U' value of 0·118 for a total wall thickness of 6 in. For comparison the stone-faced brick non-loadbearing walls of the Rockefeller Building, New York, weigh 155 lb. per sq. ft.; 12 times the weight of the building in Cincinnati.

Finally, one of the oldest building techniques, that of timber cladding, can be included in this category. Vertical boarding in one of the African hardwoods, or western red cedar, has much to commend it. Care must be taken to ensure that conditions which encourage timber diseases are not created. For multi-storey buildings low fire resistance of timber normally necessitates separate provisions to reduce the risk of fire spread and adequate thermal insulation must also be provided separately. Cedar has particular merits as a cladding timber as it weathers naturally to an attractive colour and does not require oiling or other surface maintenance. The L.C.C. have found it an economical and speedy form of infill panel for high boxframe, flat structures and its cost and availability make it a logical material for large or small buildings.

The clock demands that I should draw this paper to a close, reminding you that it must be regarded only as a sketchy outline of some of the problems and advantages of non-traditional methods and materials for the external cladding of framed structures. The most important part of this evening should be the discussion to follow, when I hope you will not merely ask questions, which it is unlikely I shall be able to answer, although our Chairman will no doubt be able to do so, but rather that you will fill in the very many gaps I have left in this very inadequate survey. I trust also that your experience with cladding techniques will be shared with us tonight, so that we may commiserate with you over your failures and rejoice with you over your successes.

I hope we have shown in this necessarily briefest of summaries that new methods of cladding buildings and the old and new materials employed can give us colourful and exciting buildings, if we take the trouble to study our materials and techniques and learn how they work together. The problems may seem difficult to solve, but as we said at Torquay in 1953, if such techniques appear to be logical architectural devices, we must settle down and work them out properly. I believe the result will be more satisfactory and economical buildings and lively worthwhile architecture.

DISCUSSION

Mr. Richard Sheppard [*F*], proposing a vote of thanks to Mr. Mills, said: I have heard this paper, with variations, twice before and on each occasion I proposed or seconded the vote of thanks. As a matter of fact (I will be quite honest about it) on the second occasion I asked to be allowed to do so, because I had been so impressed with the paper the first time I heard it. Having heard the modifications which time and experience have brought to it, I shall still be delighted to propose a vote of thanks to its author whenever he reads it to a meeting.

The first time I met Mr. Mills was in New York, where he was looking at many of the buildings which you have seen on the screen this evening. I felt that he got a great deal more out of them than I did, but I have learned a great deal since I came back, from hearing him. That is one reason why I am so glad to propose this vote of thanks, and another reason is that I feel the approach of which this paper is a brilliant example is the kind of approach which we, as architects, have to make to our job if we are going to maintain our position today.

I suppose that in the 18th century the majority of buildings which architects were called upon to design were of the traditional form of construction, with which Mr. Mills has dealt only very briefly this evening, and the architects were selected in those days, I suppose, largely because of some personal formal qualities in their designs. They were selected by members of the limited oligarchy of the day, most of whom were fairly well informed on aesthetic matters, and they selected their architects according to the type of mansion or house or church that they wanted. That produced, as we know, a reasonable form of architecture.

Since then however the position has

860 Lakeshore Drive, Chicago. Architect: Mies van der Rohe. Steel mullions as bold pattern to glass façade

entirely changed. We no longer have a limited cultured oligarchy. We now have a democracy without any adjectives at all. We are called upon now to design an entirely different range of buildings which are utilitarian in character and which are required by the society and the democracy of our time. In many cases our client is no longer an individual but is a committee or a board or some other amorphous body, and they do not employ us because they like our faces or because we are supposed to have a feeling for a particular type of architecture. They hire us, I think, very largely because of our ability to perform and execute a given job in a given time and for an established cost.

In other words, we have to use our technique to the fullest and therefore we have to examine the types of plan and types of structure and our technique generally very carefully against a pattern of cost and efficiency which our predecessors did not have to endure. We have to look at our buildings from a very different angle. We have to start very much with the idea of relating cost and efficiency with the logistics of the building in mind, with its cost and physical performance in the forefront of our minds, and the selection which we make, at a later stage, of the materials which we are going to employ will depend upon the evaluation of those factors which I have just mentioned. It will not be a game of guessing or of preferring one thing to another; it will be a task of analysing the particular problems of the building.

That is the precise way in which Mr. Mills has approached his problem this evening. He has given us the physical characteristics and the cost characteristics, and after that he has dealt with the formal and aesthetic characteristics of the wall materials which he is considering. That is a much better approach, I think, than the one of saying: Let us do this because it looks exciting; let us all go in for curtain walls, because the manufacturers want us to do so; or let us all go in for yellow stock bricks, because the brick companies like us to use them, or

because X is using them and doing it so well. X may have examined the logistics of the problem and know the answers which you do not know, because you have not had an opportunity of going into the subject with the same care as X has given to it.

It is precisely for those reasons that I want to congratulate Mr. Mills this evening. The approach he has used is the approach which we have to use, and if we are to succeed as a profession today we have to equip ourselves to design in this particular way to suit the society in which, whether we like it or not, we find ourselves.

Mr. Howard Lobb, C.B.E. [*F*], seconding the vote of thanks, said: I have not had the advantage of being called upon either to propose or to second this vote of thanks before, but I am very proud of the honour of being asked to second it on this occasion. Unfortunately for me, Mr. Sheppard has said most of the things that I wanted to say.

It is probably not quite up to date in these days, particularly in a gathering such as this, to talk about architects like Sir Edwin Lutyens, but he did have a very clear and real knowledge of materials, and I think that Mr. Mills can be classed with Sir Edwin Lutyens in the knowledge of materials which he has shown us that he possesses.

On the question of materials, I should like to advocate the use of vitreous enamel panels, which I think might play a very real part as wall coverings and at the same time enable us to introduce colour into our buildings. I do not think that Mr. Mills has sufficiently stressed the gain in floor area that can often be achieved by the use of materials of this kind and the capital gain obtained, particularly when one takes into account the amortisation value of the capital gain and the increased rental over the years which can be obtained by a few extra inches in the actual walling all the way round. Mr. Mills mentioned a building in America where the extra square feet had brought in a quite considerable rental, and if we take that rental over the years in the life of the building it would probably account for many times the value of the curtain wall and the extra cost that was involved.

Mr. Mills makes the whole problem of curtain walling sound very easy, but in case some of you may be going out full of enthusiasm and intending to use it tomorrow, I ought to mention that there are snags in it. I should like to tell you about one snag which was run to earth with some difficulty but fortunately not laid at our door.

Mr. Mills showed on the screen a building at Peterborough designed with slate panels in aluminium frames; these have all the usual mastics and mechanical barriers. We found that we were getting water in the building, dropping very mysteriously on a board in the drawing office. This happened when there was not any particular condensation or any rain; sometimes it happened and sometimes it did not, and it was very mysterious indeed. My partner and I went into all the details and looked at the drawings, and we imagined all kinds of things that might be likely to happen. We discussed whether we should call in Mr. Mills to find the answer to the problem, but eventually we found the answer ourselves. One of the girls in the office in the floor above had a craze for pot plants and she was very prone from time to time to overwater them, and the water managed to find its way down.

There are many other problems involved, such as that of the expansion and contraction and the hardening of mastics. Not long ago Mr. Allen and Mr. Mills bounced large samples of mastics between them, with resounding noises, at Torquay. We have to pay very real attention to this question of flexible joints and mastics.

Mr. D. Gastrell Lewis (Institution of Heating and Ventilating Engineers): One thing that struck me about most of the buildings we have been shown this evening, with the exception perhaps of the Swiss ones, was their monotony, in spite of the differences in texture and colour.

Texture is very important. Most of the finishes described to us this evening have a smooth surface, whereas those that I have seen abroad have a broken surface which breaks up the light and is much more attractive to the eye.

Mr. Gordon Steele [*A*]: I have been told that in the United Nations building considerable trouble is experienced on the lower floors by the penetration of rainwater through the curtain walling, apparently caused by the quantity of water running down the face of the building. Is that in fact the case? If it is, what is the weakness and what is the point of penetration, and is there any cure for it?

Mr. Mills: I do not know whether the penetration has occurred particularly at ground level. I do know that the problem has been penetration through the whole of the face of the building, and I understood that the major part of the problem was the rain being sucked up the face of the building as it was driven across the river by high winds. When I was there in 1953 very considerable maintenance work had been carried out. It consisted of filling up most of the weepholes and adding further protecting angles, and using very large quantities of mastic in order to stop up the faulty areas.

The only problem which I heard of regarding the ground floor was that the large panels of plate glass had been broken by very high wind pressures. Originally the Corbusier scheme arranged for the ground area to be left open, and I have a private theory, which can never be proved, that if it had been left open the high wind would have passed harmlessly through the building, so that a great deal of trouble would have been avoided.

Mr. Thomas Mitchell [*A*]: There has been considerable deterioration in the porcelain enamel road signs put up in the 1930's, in many cases in the countryside, where there was no question of boys throwing stones at them. In view of that and the liability to damage on building sites, I should view with some suspicion the use of enamelled steel sheets for putting on buildings.

Mr. J. Heap [*A*]: One point with regard to curtain walls is that in many cases the bye-laws preclude the use of a very thin cladding. In my own city we are virtually precluded from using it, because the bye-laws state that we must have at least 8½ in., and in many of these systems it does not come to that.

Mr. Mills: You are not working on the new model bye-laws?

Mr. J. Heap: We are working on the new model bye-laws, but not all cities will accept them.

Mr. A. N. Marr, A.M.I.C.E.: It appears to me that there is some scope for the centralised study of successes and failures in curtain walling. Each architect who tackles a curtain wall job has to do a good deal of basic enquiry and study before he can be reasonably sure of success. I am not sure how this centralised study can be organised, but I think it has to be undertaken. Possibly architects collaborating with the Building Research Station may be able to do something of this sort, so that when an individual comes to tackle a job he will at least have a whole range of successes and failures before him. He will then be able to make some definite progress, and it will not be necessary for everyone to start from scratch.

With regard to the question of noise exclusion, I am not satisfied that curtain wall buildings are the answer to the problem where there are street noises. I noticed that Mr. Mills carefully avoided that point, and if he has anything to say on it I should be very glad to hear his views.

Mr. Mills: On the question of successes and failures, I understand from our Chairman that the Building Research Station is in fact carrying out research into this whole question. I am sure therefore that he would welcome reports from architects and others concerning not only failures but also successes, so that they can be put into the records of the Building Research Station and be available to the profession as a whole.

With regard to sound penetration, I think that Mr. Marr has made a very important point and one which I did not make in the paper. It is a problem which we have to consider very carefully and seriously. I cannot go any further than that.

Mr. O. J. Masterman, A.M.I.C.E.: I should like to thank Mr. Mills for his very valuable review of present knowledge on a subject on which many of us have been wanting information. I think it is no discredit to say that the paper does leave a number of questions unanswered, and I should like to put two quite simple ones.

Mr. Mills mentions in his paper only one

cost, the universal figure of 5*s.* per sq. ft. for the cavity wall. Of course, we all have that very much in mind when we try to design a cheap cladding material which is non-load-bearing. It is very difficult indeed to get down to that sort of price, and that is largely because the fixings and the weathering of the joints and the framing cost so much money. That is especially the case perhaps with metal framings. One immediately thinks of wood, but when one looks at the model bye-laws one finds that wood is absolutely excluded, because it is combustible. I should like to ask Mr. Mills what is his view with regard to the durability of wood used as a framing and also with regard to the fire resistance value of it. I should also like to ask him whether the model bye-laws are under review, particularly in regard to fire resistance, and whether we shall be able to use a certain amount of combustible material in the framing or in the cladding of these light curtain walls.

The Chairman: I understand that the fire position as regards curtain walls is under review. I think that the regulations were not framed with curtain walling in mind. I believe that one of the things which fire brigades dislike is the idea of curtain walls coming unstuck from the building. They are also concerned about buildings like blocks of flats and buildings in narrow streets, where the exposure risk from one building to another is very high. I think that at the present time one would have to consult the local authority concerned to find out what their particular views were.

Mr. C. L. Headings [*A*]: I heard some time ago that in an atomic explosion in America a timber house within a mile of the explosion was tested, and apparently it did not burn, because it had been treated with some material which made it non-inflammable. Cannot we treat our timber with something like that?

Mr. Mills: There are fireproofing liquids available and one can also impregnate timber to reduce its combustion, but the main question is one of duration, whether the effect of these treatments lasts very long or not.

Mr. G. W. Mack: With regard to Mr. Mills' suggestion of using a surface which will absorb moisture, I am not at all sure that that would be suitable for very tall buildings, particularly if a rather thin porous material is used to save weight. It seems quite possible that, when rain is blown against the building by wind at high speed, a 2-in. cladding, however porous, would very soon become saturated and moisture would run down the surface. That position would also arise where there are large quantities of glass.

I agree with Mr. Mills that heat-absorbing glass does absorb a considerable amount of heat, and this can cause the mastic to harden quite rapidly. That is also true of any dark-coloured glass on the surface of the building.

I also agree with Mr. Mills that paint requires maintenance, and maintenance can be very difficult indeed if we tuck away something painted behind glass.

Mr. John Stillman [*A*]: I should like to say a word or two in defence of timber. On the question of durability, I have had, more by accident than anything else, to deal with this matter to a considerable extent. It appears that timber itself will not decay, except by beetle or other attack. There are some timbers which are very resistant to such attacks in their natural state, and there are others which, on being impregnated with a preservative, will be equally resistant. I would say that such timber is certainly as durable as, if not more durable than, the other materials about which we have heard this evening.

I have been told that timber is the perfect material for prefabricated and light construction; it is very difficult to damage in transit and it can be cut by a saw to the right lengths on the site, which cannot be done with steel.

The Chairman: With regard to the building which is mentioned in the paper and to which Mr. Howard Lobb referred, where the use of non-traditional cladding brought about a net gain of 3,200 sq. ft. let at £2 per sq. ft., that would mean an extra rental of £6,400 per annum, which would write off in 20 years £90,000 to £100,000 capital, and that could presumably be set against any extra cost. This shows the savings that can be effected by the use of non-traditional claddings.

Mr. Mills: I should like to thank the Chairman for presiding at this meeting, and Mr. Sheppard and Mr. Howard Lobb for proposing and seconding such a pleasant vote of thanks. I shall book them up immediately after this meeting for the next occasion!

I also thank the contributors to the discussion and all those who have been so kind in providing me with the material, photographs and information which have made this lecture possible.

The Inspection of Churches Measure

By S. E. Dykes Bower, M.A.(Oxon.), F.S.A., A.A.Dipl. [*F*]

Because all churches will shortly have to be inspected regularly for structural defects, we have asked Mr. Dykes Bower, Surveyor of the Fabric of Westminster Abbey, to contribute this article to advise architects who may not be fully conversant with the subject.—Editor.

THE INSPECTION OF CHURCHES MEASURE 1955, which is framed to ensure that every church shall be inspected by an architect at least once in five years, has not yet come into operation in every diocese, but has been anticipated on an experimental and voluntary basis in those of Lichfield since 1945, London since 1947, Worcester and Rochester since 1953 and Bath and Wells since 1954. More recently it has been put into practice in others, and approval of a scheme will be required of every diocese by 1958. In the light of the experience already gained of its working, some problems have come to notice which are of importance to architects on whom the success of the scheme primarily depends.

Of the essential wisdom of the measure there can be no doubt. No one who makes a practice of visiting churches with an observant eye can fail to see obvious structural defects in a high percentage of them. In many cases these defects are recognised by those responsible—the Parochial Church Council; in others, and by no means a few, what might be expected to be a cause for anxiety seems to be unknown or disregarded. To compel a parish to set about repairing its church may continue to be difficult; but at least it should not be left in ignorance that repairs are needed. One of the benefits of the measure is that those who would not otherwise seek competent advice will no longer be left without the enlightenment and warning it may give.

The magnitude of the task that must fall to architects in the periodic visiting and examining of nearly 16,000 churches is certainly one of the major problems at present. Not every architect is interested in this sort of work and perhaps only a limited number have the experience of old buildings which is needed. The work must often entail a disproportionate amount of time in travelling and the subsequent writing of reports is likely to absorb much more. However agreeable may be the opportunity of visiting churches on a fine warm day, their soaking churchyards and ice-cold interiors are less congenial in the winter; while mounting awkward stairs to belfries or clambering about in the confined space between outer and inner roofs, interesting though it may sometimes prove, is an infallible means of getting extremely dirty.

If it is natural that such work should attract chiefly those architects who are capable of enjoying it, even for them the relationship between time and remuneration must be important. Churches vary greatly in size and condition and it may take

longer to make notes on a small church in poor structural repair than on a large church in good condition. Unless the architect already has some notion of what he is likely to find, he cannot be sure how much he will be able to accomplish in one day.

The Diocese of London pays a fee of 25 guineas for a first inspection and the diocese of Liverpool 15 guineas. Other dioceses, which have fixed their rate of payment, pay less—10 guineas is about the average, with a smaller sum for second inspections. However much therefore the work may be undertaken in what may be called a sacrificial spirit, an architect should not be expected to make his task excessively burdensome. The value of his report will depend on the thoroughness of his inspection and his object must be to produce a factual record of the state of the fabric and its contents. He may well give some brief architectural description of the building; but it should not be necessary for him to preface his report with historical notes, since such information is usually available in books or pamphlets. It would be superfluous, for example, to recapitulate such facts as are concisely and accurately set out in the *Sussex Church Guides*, which have been compiled for the diocese of Chichester.

On the other hand an architect should certainly draw attention to things that are not normally mentioned in guide books and may be less esteemed than they should be. What is unfashionable is all too often neglected, if not maltreated; and a disposition to tamper with what may be better left alone can sometimes be checked if the object of prejudice can be treated to a little praise.

Circumstances will dictate what is feasible. The purpose of a first report should be to tell a parish what is the real state of its church; and in many, perhaps a majority of cases, that will entail a lengthy exposition of defects which, whether great or small, ought to be put on record, even if there is no immediate prospect of remedying them.

No one would wish to paint too gloomy a picture of the condition of churches, which today have to be maintained not by the many but by the few. Nevertheless anyone accustomed to the care of old buildings (and some not so old) must feel that there is a danger today of minimising their need of repair. A first quinquennial report, however much it reads like a catalogue of troubles, is the opportunity to present the truth. If action follows from it, the second may be less gloomy.

Yet while it is easy enough to observe the faults that show, it is not at all easy or necessarily possible to detect those that are out of reach or out of sight. In spite of advances in building and medical science, churches no less than human beings remain a prey to minor ailments as well as serious ills. Their chronic invalids are only tiresome in living longer. But today, on the analogy of preventive medicine, there is some tendency to what may be termed a clinical approach to the care of church fabrics. That, while sensible enough in principle, nevertheless asks more of architects than it may be possible for them to give. Inspection of a church must often be incomplete because it may be physically impossible to reach the very places where trouble may be most serious—the bearing ends of the roof rafters, for example, where they rest upon the wall. If there is death-watch beetle in the timbers, it may well have started there, the woodwork being affected by damp and lack of ventilation, perhaps causing fungal decay as well. In a lofty interior, if beetle dust is not found on the floor, it may be impossible, even with field glasses, to see signs of death-watch beetle, for the roof may be dark as well as high. An architect cannot be expected to spend time ascending ladders in different positions in search of this pest, for each position might still miss the location of its activity. It should be remembered, too, that architects are not called on to be steeplejacks.

Experience of old buildings can hardly fail to promote caution about giving any assurance that all's well that looks well. Like a doctor, the architect has to make a diagnosis; but whereas a doctor, if he suspects something is wrong, can tell his patient that an exploratory operation would be advisable, an architect is most unlikely to be able to persuade a church council to incur the expense of erecting scaffolding, lifting gutters and stripping parts of a roof unless he feels reasonably sure of being able to demonstrate that, when this has been done, the discovery justifies the cost.

A report cannot therefore be in all cases conclusive and to guard against possible misunderstandings later it is wise to make this clear. There is not at present any practical form of architectural X-ray whereby suspicions can be checked; but to judge by what is usually revealed when old buildings are opened up, it is safer to assume the worst than the best.

A further matter affecting the content of a report is the extent to which the architect responsible for the inspection should prescribe the mode of repair. In those dioceses where a scheme has been adopted for the working of the measure, he may or may not have charge of any repairs subsequently executed. If there is the certainty that he will have such charge, it should be optional to describe how it might be carried out. If otherwise, there need be no obligation to go into detail. A description of what is defective would probably be accompanied by some indication of the appropriate remedy; but any attempt to specify precisely the works required would lengthen a report unduly and add far more labour than the payment would warrant. From the professional angle it is essential to maintain a clear distinction between the issue of a report on the state of a structure and a commission to prepare drawings and a specification and to undertake supervision of the work to be carried out.

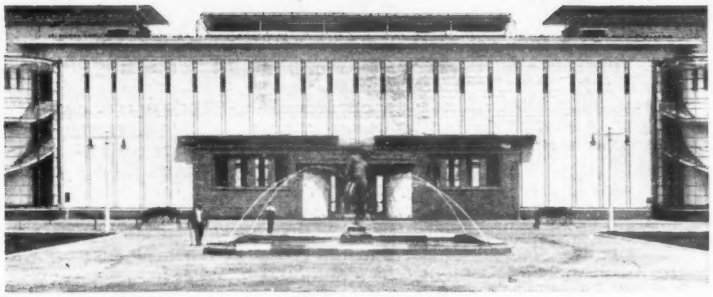
This point has a bearing on how much information an architect should be expected to give. To judge by the questionnaires drawn up as a basis for reports by some dioceses, there is a tendency to ask for too much. An architect may volunteer some indication of probable cost, if he feels sure that he can assess it with reasonable confidence, but it would be fantastic to imagine that, in many instances, it could be assessed at all. Every architect finds himself pressed to give figures of cost, when he knows that they can be no more than a guess; significantly, it is much less easy to press builders.

Inspection of the fabric of even a moderate-sized church is likely to take some hours. Is an architect to enlarge his task to reporting on such things as lightning conductors, electric wiring, the condition of the boiler and heating pipes, the drainage, the bells and the organ? There is surely the risk that if he tries to do too much, his work will be less thorough. What he observes to be wrong, he will mention. If there is furniture beetle in the woodwork of the organ, it would no doubt be noted in a paragraph on the general state of the woodwork or the fittings: not many architects could claim competence to express opinions on the condition of the instrument itself, or on the bells and bell frame. If electric wiring is obviously dangerous or so out of date as probably to be unsafe, the parish should be enjoined to seek expert advice. But the testing of lightning conductors and electric installations is a specialist's job and architects should resist any implication that they are all-round handy men, who can pronounce on matters not strictly within their province.

The form of the report can be left to individual judgment. An architect may prefer to work to a programme laid down or to frame his own. So long as the essential information is given it should not matter in what order it is set out: the architectural form of the building ought to suggest a natural sequence and it may sometimes be simpler to discuss completely one section, such as the nave or tower, rather than to consider the church as a whole in respect of its various components—foundations, walls, roofs, windows and so on.

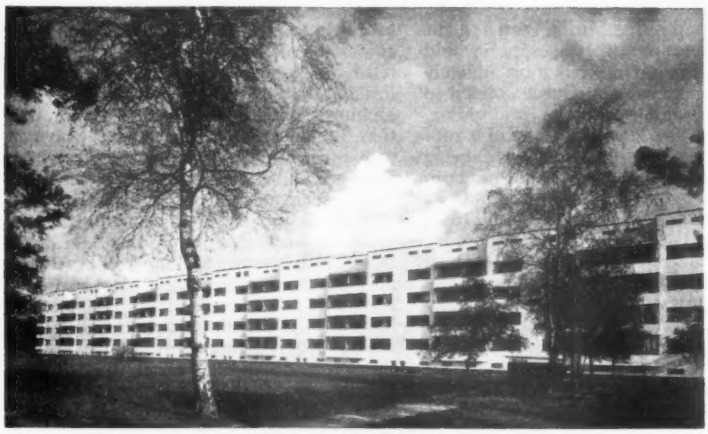
The latter system is liable to turn a report into a series of notes, which may be adequate but is not the type of report which is most readable. Disjointed comments do not hold attention so effectively as a consecutive statement which gathers interest as it proceeds. It is the fate of too many reports to go unread. The quinquennial reports on churches will be beneficial in proportion as they are read and heeded carefully.

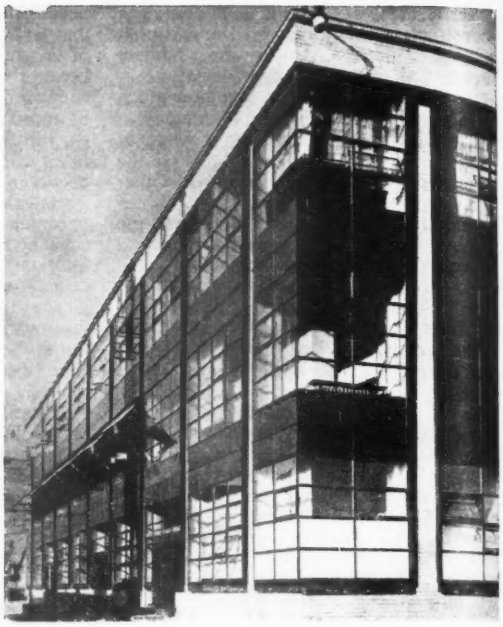
A pamphlet, *The Inspection and Care of Churches* published by the Church Information Board, price 6*d*., gives much useful advice and the measure itself should be studied.



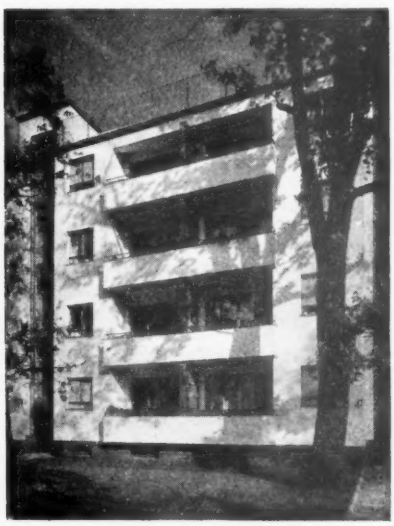
Werkbund Exhibition, Cologne, 1914; with Adolf Meyer

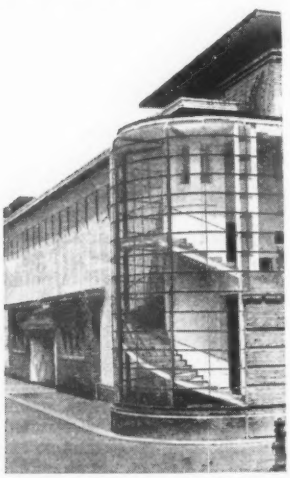
The Work of Walter Gropius
Royal Gold Medallist 1956



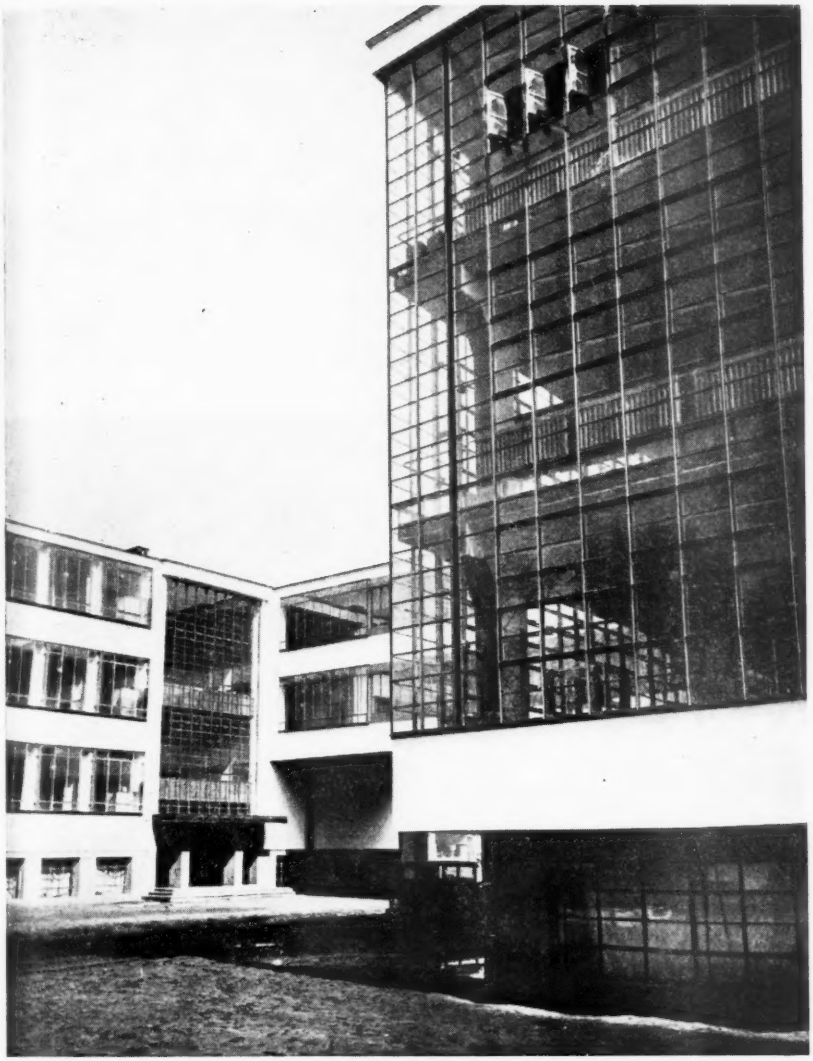


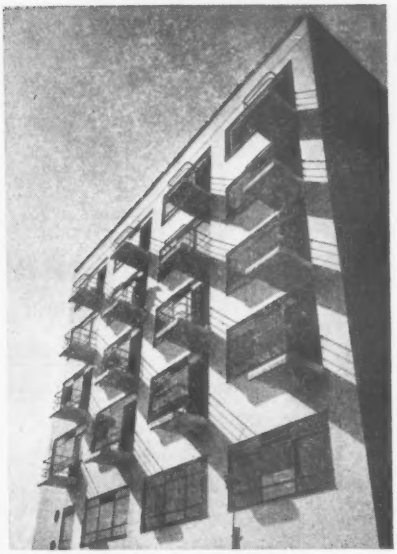
Above and below: housing at Siemensstadt, Berlin, 1929
Above, right: the Fagus Shoe Last Factory, Alfeld, 1911; with Adolf Meyer.
Right: Competition design for the Chicago Tribune Building, 1922





Above: staircase at the Cologne exhibition, 1914





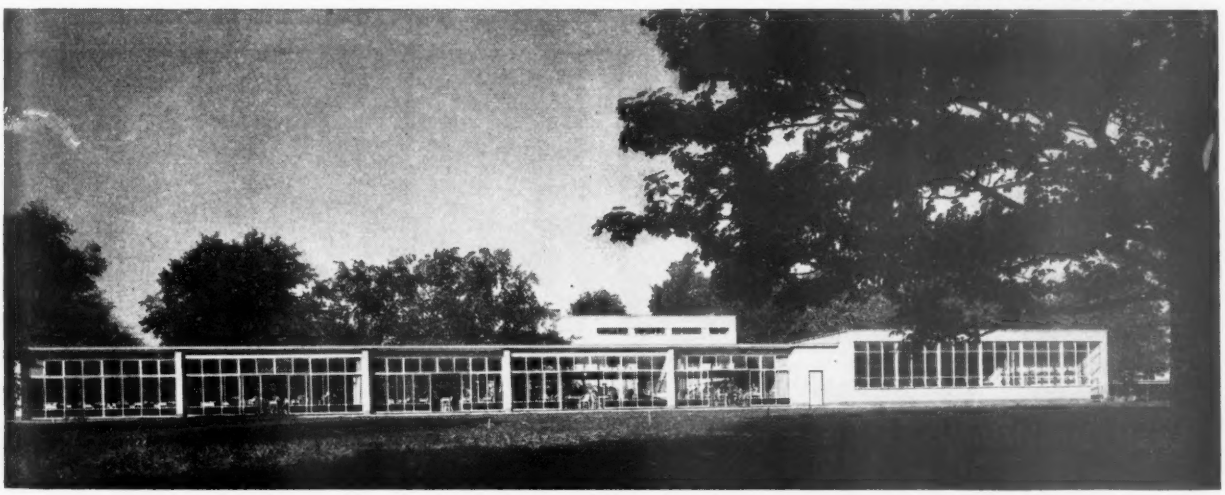
Left and above: Bauhaus building, Dessau, 1925

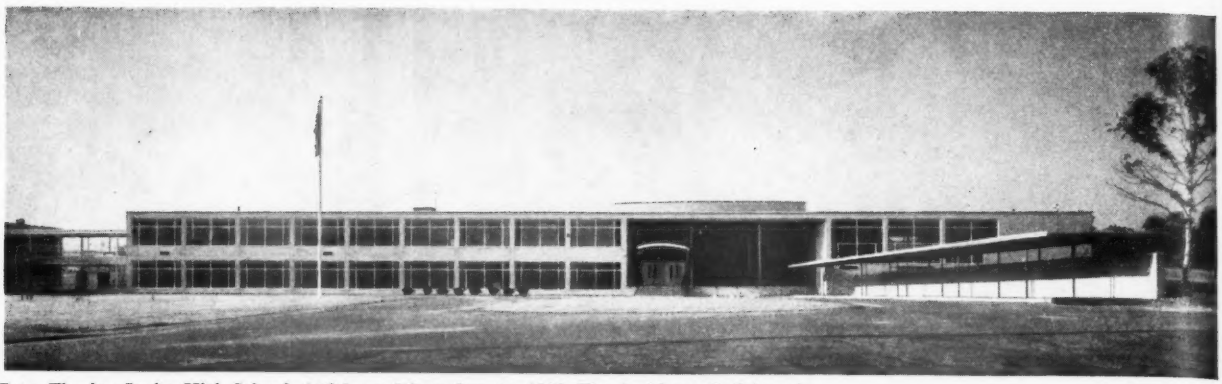
ON 10 April before a crowded audience in the Henry Jarvis Hall, the President R.I.B.A. presented the Royal Gold Medal for 1956 to Dr. Walter Gropius. The speakers were Sir Herbert Read, Professor Sir William Holford [*F*], Dr. Nikolaus Pevsner, Dr. J. L. Martin [*F*], Mr. J. M. Richards [*A*] and Mr. Maxwell Fry, C.B.E. [*F*]. A full report of the speeches will appear in the next JOURNAL.

In these pages we illustrate a selection of the executed work of Dr. Gropius; his greatest contribution to architecture—his work as a teacher—does not lend itself to illustration but was described and discussed by speakers at the presentation ceremony.

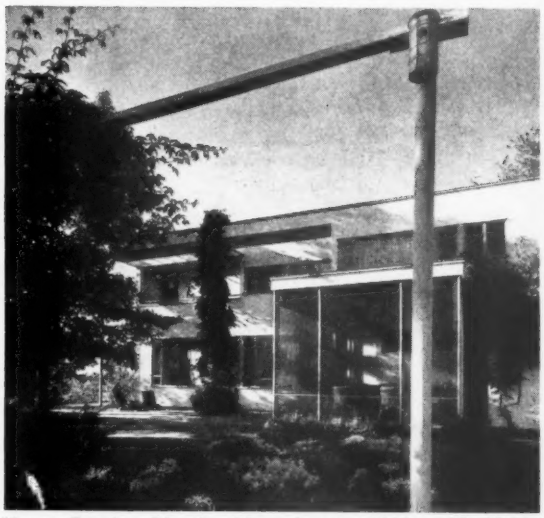
The buildings illustrated on these two pages can be considered as prototypes of what is now regarded as the architecture of the 20th century. In their historical context they were revolutionary. For example,

Below: Impington Village College, Cambridgeshire, 1939; with E. Maxwell Fry [*F*]





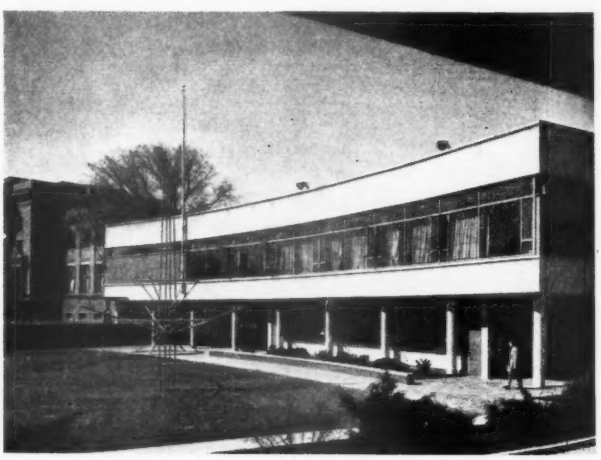
Peter Thacker Junior High School, Attleboro, Massachusetts, 1951. The Architects Collaborative



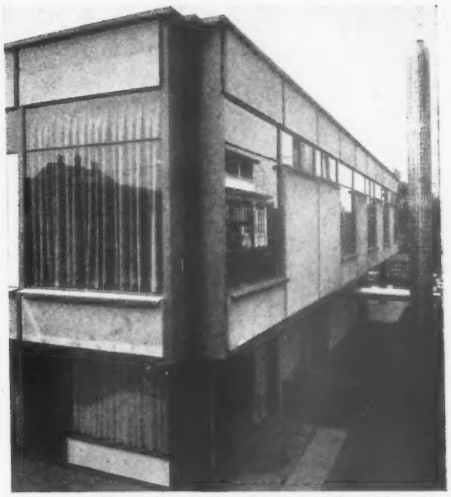
House Gropius, Lincoln, Massachusetts, 1937: with Marcel Breuer

Office building, Chicago, Illinois, 1953. The Architects Collaborative

Below: residence in Pittsburgh, Pennsylvania, 1939; with Marcel Breuer. Below, right: Harvard Graduate Center, Cambridge, Massachusetts, 1950. The Architects Collaborative



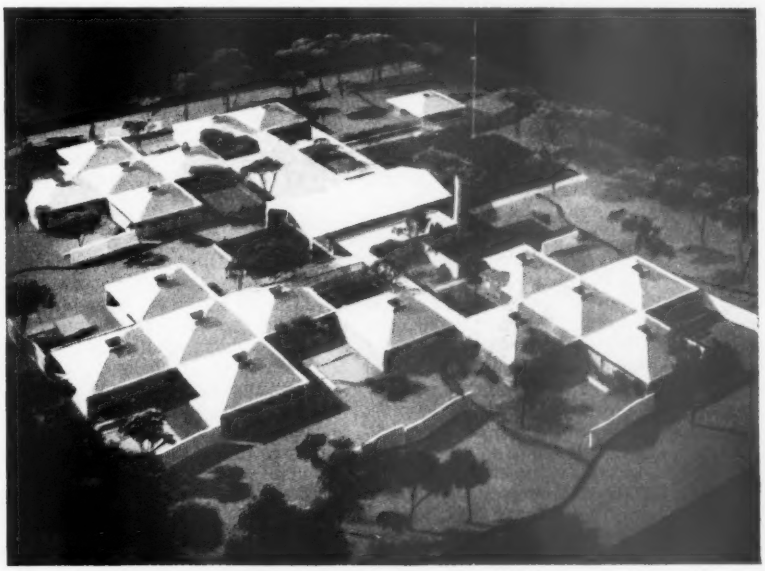
The Back Bay Center, Boston, Massachusetts, 1953. Boston Center Architects—The Architects Collaborative, Pietro Belluschi, Walter F. Bogner, Carl Koch and Associates, Hugh Stubbins, Jr.



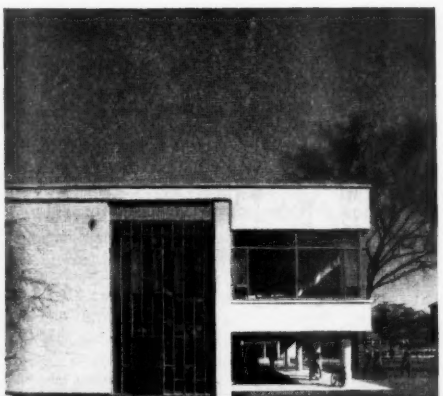
Overholt Thoracic Clinic, Boston, Massachusetts, 1955. The Architects Collaborative

how many British schools have not followed from Impington Village College, or industrial buildings from the Fagus Factory? The Chicago Tribune Building design was far too novel for the competition assessors who gave the award to a pseudo-Gothic design, but most present-day tall office buildings are its lineal descendants.

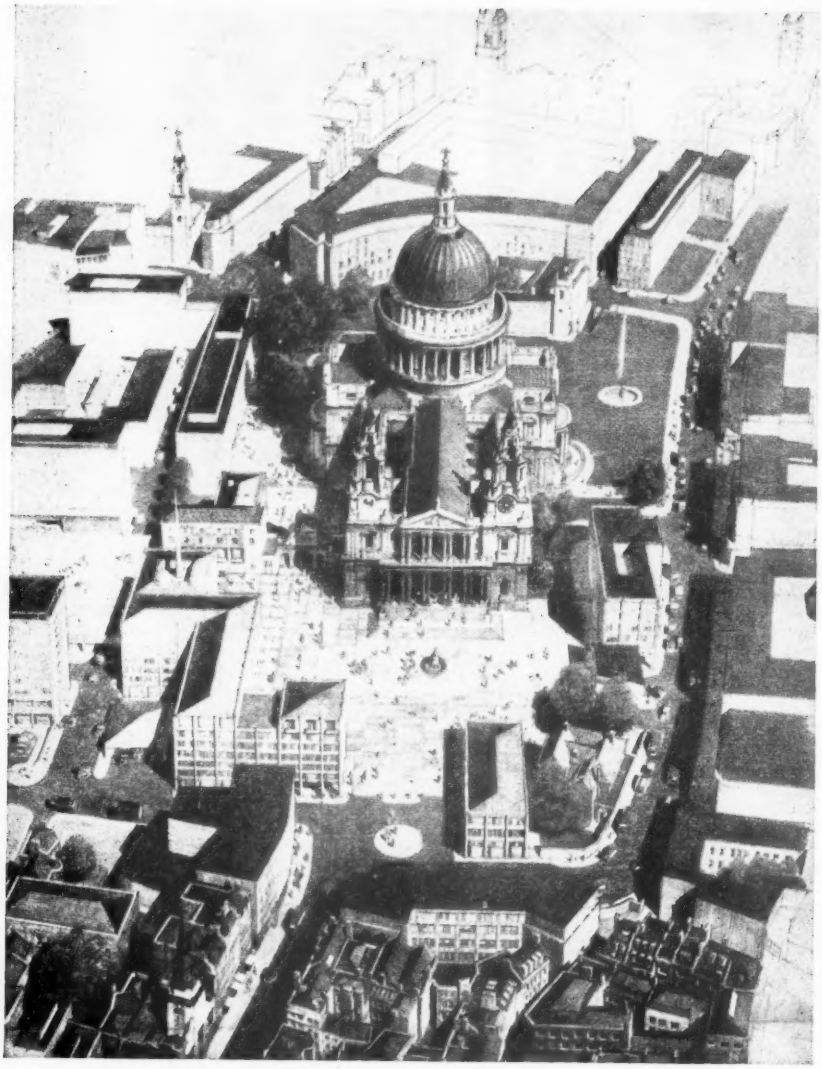
On 12 April the Architecture Club entertained Dr. and Mrs. Gropius to dinner at the Ironmongers' Hall. Viscount Esher, G.B.E. [*Hon. F*] was in the chair. The company, which numbered 170, included many persons eminent in the fields of industrial design and furniture design in addition to architecture. The speakers were Dr. Julian Huxley, Mr. J. C. Pritchard, Mr. Geoffrey Dunn, Mr. Henry Morris and Mr. E. Maxwell Fry, C.B.E. [*F*].



Flexible school made up of classroom clusters, 1954. The Architects Collaborative



Detail of Harvard Graduate Center, Cambridge, Massachusetts, 1950. The Architects Collaborative



The Precincts of St. Paul's

Architect: Sir William Holford, M.A.(L'pool), P.P.T.P.I., F.I.L.A. [*F*]

A FUNDAMENTAL decision to be made in replanning the surroundings of St. Paul's was whether to create some form of enclosure or precinct which would isolate the Cathedral in the agglomeration of commercial buildings which constitutes the City of London or whether to accept the fact that it is a dominant, if not *the* dominant, feature. Sir William Holford has decided in favour of the latter.

This decision is not so simple as it may sound. It involves relating St. Paul's to a great number of buildings, both close and distant and either existing, under construction or projected. Overshadowing all ideas of what might be kept, destroyed or newly built is the problem of replacing lost office space, a commodity which has too long been in short supply in the City and one by which it lives. Better traffic circulation and parking also are urgent needs.

Sir William Holford's scheme has resulted from the action of the Minister of Housing and Local Government who, in approving the County of London Development Plan, asked for a modification of proposals for the surroundings of St. Paul's. The Minister said he believed an opportunity was being lost of providing a worthy setting for the Cathedral. The City Corporation accordingly appointed Sir William to reconsider the proposals for this area in detail without defining precisely the extent of it.

In his report Sir William states that there are three related problems: (1) The buildings and spaces immediately adjacent to the Cathedral; (2) The intermediate range of buildings and open spaces farther to the north and south; (3) More distant developments concerned with the preservation and improvement of the approaches and with longer views of the dome and towers.

The whole problem, says Sir William, is one which has defied solution for nearly three centuries. There never has been—and is not now—anything like a clean slate.

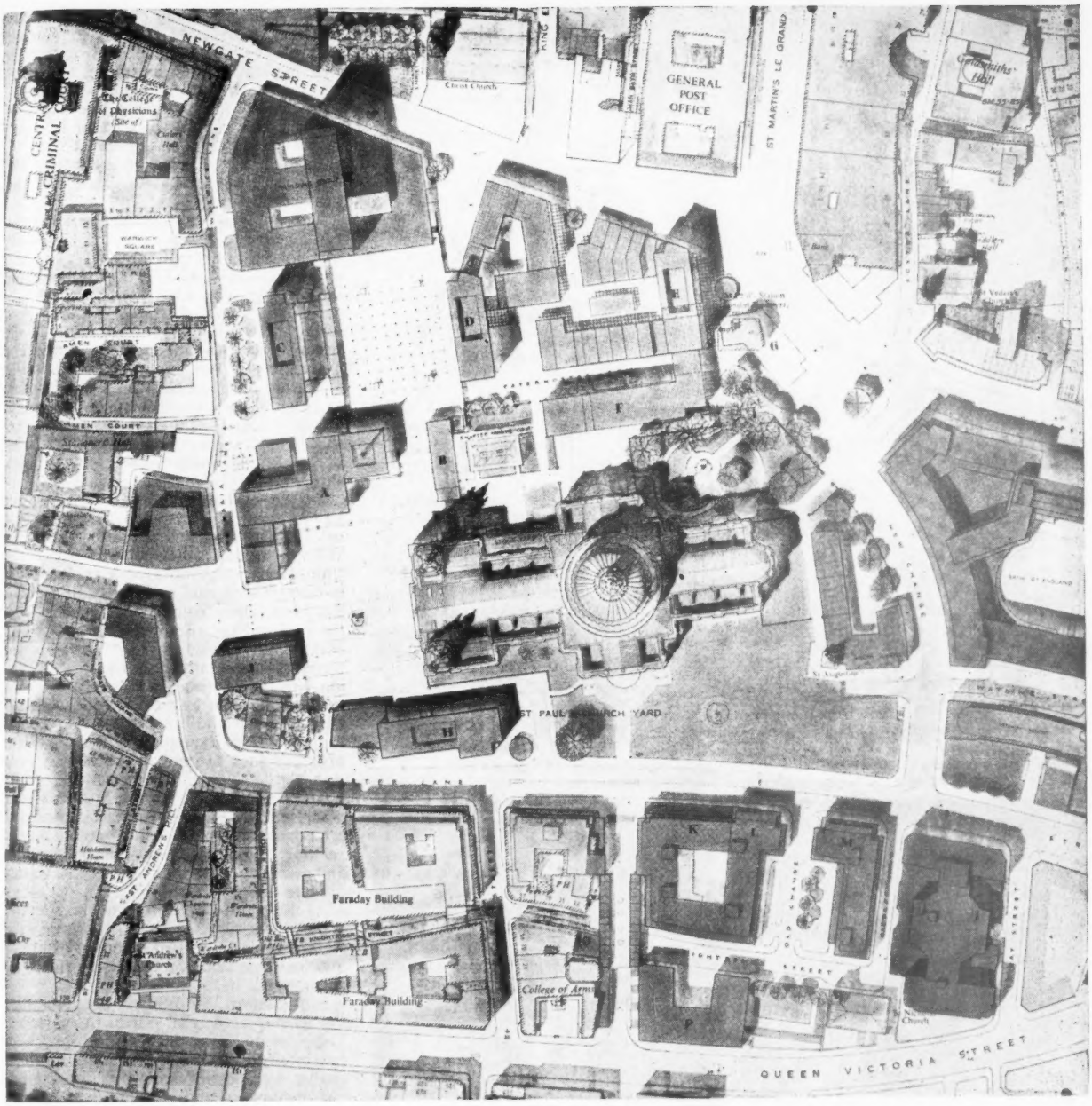
Wren appears to have taken the view that the Cathedral should be sited in the fork of a Y of streets and that the view of it from the long leg of the Y—Ludgate Hill—should be an oblique one. He appears deliberately to have tilted the long axis some 6½ degrees out of the original line of Old St. Paul's in order to emphasise this. The resulting oblique approach and view are typically English. Sir William has extended them into the whole of the planning, both near and distant, so that the spectator will not see the Cathedral axially as a whole from any point, but obtain 'moving view points' from a number of directions in the City.

Nevertheless, his first design incorporated a formal, enlosing fourcourt, semicircular in plan and, apart from a slight obliquity of its entrance from Ludgate Hill, axially disposed about the west front. This design was presented to the Minister's Advisory Committee, who appear to have had few objections to it. The chief objector was Sir William himself. After preparing the design, he came to the conclusion that the forecourt was not large enough to form a monumental open space, and that it could not be made larger—indeed, that it was already too large for the site—and, finally, that the half-circle form of the forecourt would appear trivial in comparison with the similar and dominant form of the dome. He therefore abandoned this first design and set out to create a new one.

The present scheme may be said to have three basic elements: (1) The diversion of the main east-west traffic artery farther away from the south side of the Cathedral than it is at present; (2) Prescribing of the site areas and heights of other buildings in the vicinity; (3) The formation of open spaces and car parks—an element which follows naturally from and is an essential part of (2).

The diversion of traffic on the south side is a proposal with which few people will quarrel. It will give a succession of the 'moving view points' at adequate distances on this side; it will lessen the traffic noises within the Cathedral.

As regards the design of the adjacent buildings, although these are shown in some detail in the model, Sir William says in his report that he does not suggest that the buildings should be exactly as shown. They will be erected over a number of years and architectural design is always fluid. But he is of the opinion that the siting and masses should be rigidly prescribed and



adhered to within reasonable limits and that there should be a central administration for this. In certain planning features alternatives are possible and he suggests some. Nevertheless there is a complete design behind the scheme as a whole, and it can be recognised in the form of the related open spaces between the buildings and around the Cathedral, rather than in the form of individual structures. These spaces make the setting for St. Paul's.

The series of related spaces round the Cathedral, described in a clockwise direction (see the plan above), consist of the forecourt opposite and embracing the west front, Paternoster Square and Terrace, the Chapter House and its garden, the existing public garden, New Change on the east and, on the south, a great lawn between the Cathedral and Carter Lane.

The forecourt, which is reserved for pedestrians, is flanked by two office buildings (A and J on plan) to house banks and shops on the ground floor and first mezzanine. A television gallery overlooking the forecourt is suggested.

To the north a broad flight of steps leads up to Paternoster Square which, flanked by commercial buildings, has three levels. The top level is a paved space which is intended for occasional temporary exhibitions, sub-floor lighting and power points being provided as in many open-air markets. The two lower floors are car parks, the upper of the two being at the level of Paternoster Lane and the lower at that of some existing basements.

Entry to the Chapter House enclosure from the forecourt is through Temple Bar, which Sir William suggests should be brought from its present position in Hertfordshire and re-erected. Against the Cathedral, opposite the Chapter House, will be the stonemasons' yard so that the public can watch the progress of the repair work

A view of the western forecourt showing the proposed new situation of Temple Bar which will give access to the existing public garden and the stonemasons' yard

General view of the model from the south-east showing the great lawn with its fountain and the footbridge over Carter Lane

which is always going on. There are also masonry remains of interest to students and visitors which can be shown there so that the yard would constitute, to use Sir William's word, a *lapidarium*.

The green space between the Cathedral and the heavy traffic of Cheapside would be preserved as it is and extended. Building F on plan would be low and could act as a screen between the Cathedral and Paternoster Row.

The curve of New Change, a new street, has already been fixed and the new Bank of England building is now being erected along its east side. The intention behind the siting of New Change appears to have been the removal of traffic from the foot of the apse wall, where it now runs in the street named St. Paul's Church Yard. The latter street Sir William proposes to abolish, allocating the land between the Cathedral and New Change to a new building to house the choir school. This building he suggests should incorporate the tower of St. Augustine's church which is almost the only surviving part of that building.

On the south side a much widened Carter Lane would become the traffic artery linking Ludgate Hill and Cannon Street. Sir William proposes that between it and the Cathedral there should be a great stretch of lawn. This would retain the fine view of the dome (which cannot be fully seen from the west end because of the foreshortening effect of the west front) that was opened up by the demolition following the bombing. From the south-east corner of the lawn one will be able to see the full height of the Cathedral and dome from the ground to the cross. In the middle of it Sir William proposes that a fountain, consisting of a thin, tall jet of water, be provided.

The buildings K, L, M, N and O on plan form a new layout on a large blitzed area, beneath part of which would be car parking. Old Change becomes a little square and a slender footbridge would cross Carter Lane to the great lawn.

At the south-west corner of the site, the Deanery is to be brought within the Cathedral precinct, two commercial buildings on either side of it preserving the sense of enclosure in the forecourt.

In his report, Sir William proposes that the scheme be carried out in three stages. These are much too detailed for listing here but, briefly, the first stage is mainly administrative in respect of fixing street and building alignments and settling the complex financial problems involved, together with the construction of some of the commercial buildings. The re-erection of Temple Bar is an item in this stage.

The second stage includes the virtual completion of the scheme of replanning and rebuilding on the north side of the Cathedral and that on the south side of Carter Lane, together with some demolition.

The third stage consists mainly of the construction of the widened Carter Lane and the completion of the south side of the forecourt and its buildings, together with the final details in the immediate vicinity of the Cathedral, such as the laying out of the lawn.

Review of Construction and Materials

This section gives technical and general information. The following bodies deal with specialised branches of research and will willingly answer inquiries.

The Director, The Building Research Station, Garston, near Watford, Herts. Telephone: Garston 2246.

The Officer-in-charge, The Building Research Station Scottish Laboratory, Thortonhall, near Glasgow. Telephone: Busby 1171.

The Director, The Forest Products Research Laboratory, Princes Risborough, Bucks. Telephone: Princes Risborough 101.

*The Director, The British Standards Institution, 2 Park Street, London, W.*1. *Telephone: Mayfair* 9000.

*The Director, The Building Centre, 26 Store Street, Tottenham Court Road, London, W.C.*1. *Telephone Museum* 5400 (10 *lines*).

*The Director, The Scottish Building Centre, 425–7 Sauchiehall Street, Glasgow, C.*2. *Telephone: Douglas* 0372.

Ascots and Conversions. Since the conversion and rejuvenation of old houses has become a large item in the Government's housing policy, local authorities and to some extent property owners have become increasingly active in this jig-saw puzzle branch of architecture. A major item in it is the contriving of bathrooms with the provision of a hot water supply. The Ridley Committee estimated that in 1947, 46 per cent of dwellings then existing in Great Britain did not have a hot water supply and that 40 per cent were without bathrooms.

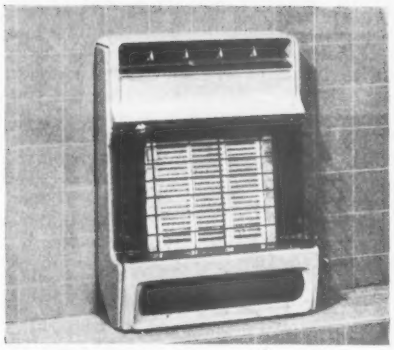
Ascot Gas Water Heaters Ltd. have a habit of producing from time to time finely illustrated and fully detailed books giving information on current building problems and showing how the firm's products can be used in solving them. Obviously gas water heaters have a large potential field of use in conversion work and Ascot's latest book, just issued, is a useful addition to the literature of the subject. It illustrates several schemes in detail, many of which are notable examples of planning ingenuity in old houses which, at a first glance, one would say could not possibly be converted into flats. Most of the flats are small—from one to three rooms—and it is in such dwellings that Ascot heaters can be very suitably used. Installation costs are low and a heater can be strategically placed to supply hot water to bath, basin and sink with short pipe runs. The book ends with a useful section on technical considerations with dimensional details. The address is 255 North Circular Road, London, N.W.10.

The GasMiser Room Heater. Even in the more-cold-than-hot climate of this country there are times when the full heat from a radiant gas fire is more than is needed, and the question arises of reducing the heat output efficiently. For many years there have been on the market gas fires in which the control tap turns out two or more radiants, leaving the rest at full strength, and this is a satisfactory method of control; without such a two-way tap one can only turn off the tap a little but then the upper parts of the radiants lose their brightness and one feels that the gas is not being consumed to its best advantage.

In recent years gas heaters have been made which warm by convection as well as by radiation, but the problem of efficiently reducing the heat remains. The difficulty seems to have been overcome in one of the latest radiant-convection gas fires, the GasMiser, with its special convection system. In this fire there are three block-radiants made of refractory material, each with an integral combustion chamber at the bottom, and the products of combustion pass into the chimney through a flue-way in the normal manner. Behind the radiants is an aluminium alloy convector unit, finned to increase the area of heat exchange, and the backs of the radiants are specially ground to ensure good contact with the unit.

Cool air from the room enters the appliance through a grille at the bottom and passes into the convection chamber behind the finned convector unit. There it is warmed and rises and towards the top it is canalised into three ducts which discharge it into the room through openings at the top of the appliance. To allow this the ducts have to pass across the flue-way and as the air passing through the flue-way to the chimney is relatively cool it would tend to cool the ducts and therefore the air moving through them and so there would be some loss of convection efficiency. To obviate this the ducts are surrounded by a casing with an air space between and through this air space a certain amount of hot air from the heat exchanger passes. Thus the hot air in the ducts is insulated from the cooling effects of the flue-way air and passes into the room at high efficiency.

The heat from the fire is controlled by a circular revolving control tap calibrated and marked for super heat, normal rate, and miser rate, but intermediate settings are possible. The super heat setting is intended for warming a room quickly, after which the tap can be turned to normal rate. If only background heat is required the tap is turned to miser rate, when the two outer radiants go out, leaving the centre one alight. For all-night burning the tap can be turned below the miser rate mark. The makers state that heat output in B.t.u.'s per hour is 18,000 at super heat, 11,000 at normal rate, 6,000 at miser rate, and 5,000 at 'miser rate minus' (all-night burning).



The GasMiser room heater

The fire is finished in cream stoved paint and cream vitreous enamel, and is provided with a flint lighter, hook-on fender and chromium-plated dress guard, and levelling screws. The outer sides of the frame are canted up towards the fireplace to allow gas supply connection to be made from either side.

The heater is a substantial job, being made of castings and not pressings as is common today. The whole top section can be easily removed, allowing access to the convection ducts for cleaning out—a feature absent from many appliances; dust and 'muck' accumulate all too readily in these hidden passages which warm the air breathed by the room's occupants.

The makers are Messrs. Cannon (G. A.) Ltd., of Deepfields, Bilston, Staffs. The present price, including purchase tax, is £29 18*s*. 10*d*.

B.S. 990: 1945. In November 1952 PD 1522 was published, being Amendment No. 6 to B.S. 990: 1945, **Metal Casement Windows and Casement Doors for Domestic Buildings.** The Amendment permits lighter sections to be used and doubts have been expressed concerning their adequacy. The Science Committee of the Institute feel that it is difficult to assess the need for further research in the absence of data regarding the use and performance of windows made in accordance with the Amendment, and now that a reasonable period of use has elapsed the Committee would like to receive information from members of the Institute about their experience with such windows.

Timber Roof Trusses. Messrs. MacAndrews and Forbes Ltd., of 2 Caxton Street, London, S.W.1, have brought out design sheets for eight typical timber roof trusses, using various connectors. The sheets are all of one size, about 12 in. by 8 in., and the format is the same, including a setting-out diagram and dimensions, elevation and plan, schedule of timber sizes and of ironmongery, and technical notes. The designs are for trussed rafters of various pitches and spans, monopitch trusses, scissors, pitched, Howe and segmental bowstring trusses. All the designs have been prepared in accordance with the recommendations of Code of Practice C.P. 112: 1952. *The Structural Use of Timber in Buildings.*

Messrs. MacAndrews and Forbes have issued these design sheets because they feel that there is a great need for guidance on the correct designing and economical use of timber, especially as timber connector construction technique allows the full strength of the material to be used and small section members to be employed without detriment to the structure. The company also feel that because of the steel shortage designers should consider the use of timber for the roof structures of buildings larger than houses, such as factories, warehouses and churches, in which experience in this country has not been great; the sheets therefore include five typical designs which should be useful in that field. The price of the set of eight sheets is 2*s.* 6*d.* a set.

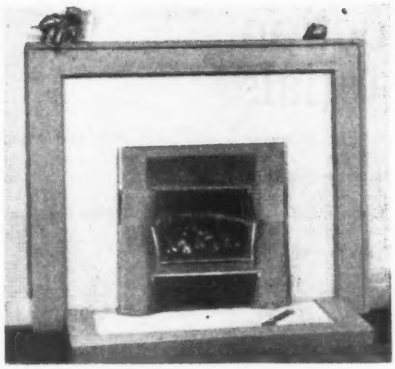
Figured Rubber Sheeting for Concrete Finishes. In recent years various methods have been used for giving concrete an external self-facing different from the normal shuttering marks. Within the last year or so the Natural Rubber Development Board has been working on the use of figured rubber sheeting for producing special finishes on concrete, and the Runnymede Rubber Company Ltd. have further investigated the possibilities and are now able to offer a wide variety of designed rubber sheets.

The sheets are moulded into various patterns, such as square studs, chequer plate, ribbed, or roughened to suggest granite. In precast concrete the sheets are placed as a lining to the casting frame, and when the concrete has set and the frame has been dismantled the sheet is peeled away, leaving its figured impress on the face of the concrete. Lubricants or oils are not required, and the sheets can be used again and again.

The rubber sheets can be made in various thicknesses according to the work required. The maximum size is 6 ft. by 3 ft. The larger sheets are suitable for in situ work and specially cut sizes are obtainable for fitting to existing moulds. The registered office of the Runnymede Rubber Company is at 6 Old Bailey, London, E.C.4.

Hermeseal Sound Insulation. Messrs. British Hermeseal Ltd., of 4 Park Lane, London, W.1, have introduced anti-noise tiles and panels made of materials which are new to this country although they have been used abroad for more than 20 years. The units are of Swiss pressed wood-fibre made by a special process, and are produced as perforated tiles with bevelled edges, grooved tiles with square edges, and as panel boards. The sizes are approximately as follows: perforated tiles, 1 ft. 7½ in. square by 1 in.; grooved tiles up to 8 ft. 2½ in. by 3 ft. 11¼ in. by 1 in. thick; panel boards up to 8 ft. 2½ in. by 3 ft. 11¼ in. by ½ in. thick.

The units can be suspended by metal channels or timber battens, or may be directly attached by a special adhesive, and they can be given a special colour finish in pastel shades.



The Redfyre open convector fire

Redfyre Open Convector Fire. This fire came on the market last March and is intended to be a compromise between an open fire and a closed stove. It is a free-standing appliance for fitting into new fireplace openings designed for 14, 16, 18 or 20 in. grates, or in practically any existing fireplace. The connection from the outlet of the fire to the flue is made by means of a flexible throat connector of asbestos and fibreglass which goes into a throat adaptor plate that is set in position in the flue and sealed with an asbestos sealing plate and cement. The flexibility of the throat connector simplifies the fixing procedure.

Convection air goes in under the fire, passes behind and around it and is discharged through the top into the room in the usual way, but an innovation is the detachable convection screen made of expanded metal, stove enamelled to an old gold colour. This screen clips on to the fire and hides the back and sides of the fireplace opening; it has a central panel of open design acting as a safety guard in front of the burning fuel. This guard can be removed from the convection screen for refuelling purposes. An extension plate adapts the fire for continuous burning. There is an adjustable throat restrictor for controlling the draught up the flue, and the rate of burning can be varied by the ashpit door, which may be set in three positions. The fire will burn coal, gas coke or the manufactured fuels. Gas ignition can be provided by means of either a located portable burner or an integral one.

The appliance is made by Messrs. Newton, Chambers and Company Ltd., of Thorncliffe, near Sheffield. The present price is £12 12*s.* 6*d.* including gas ignition and deepening bar for coke burning. The optional overnight burning plate costs 7*s.* 6*d.*

High-Density Alkathene. The material Alkathene 20 of Imperial Chemical Industries is well known and now I.C.I. have produced another form which they call Alkathene HD, the HD standing for high density, the A.20 being low-density or flexible. One of the chief differences between the two materials lies in their respective softening points, as articles injection-moulded or extruded from Alkathene HD can be heated without distortion for 15 minutes at 110 degrees C.; a treatment which would cause the flexible variety to collapse.

Alkathene HD is made by a modification of the high-pressure process and it can be sterilised; other advantages are a possible saving of raw material through reduction in wall thickness in the case of mouldings, and higher working pressures and greater heat resistance when in the form of pipes. It can be produced in many forms, such as tubing, cable-sheathing, beakers and similar articles, and it may be pigmented to any shade. When mixed with carbon it resists the ultra-violet rays which affect natural-coloured Alkathene, and this, coupled with its higher softening point, opens up greater possibilities of use in water supply services.

Codes of Practice Recently Published

C.P. 1004. Street Lighting. Part 2, 1956, *Roads other than Traffic Routes. Section* 1. *General.* This part of the Code deals with Group B lighting, i.e. the lighting of all roads, other than traffic routes, which responsible authority considers should be lighted. Roads which, although having the physical characteristics of those dealt with in this part of the Code, require Group A lighting because of the volume and type of traffic which they carry, should be lighted in accordance with the recommendations set out in Part 1.

No reference is made in this Code to lighting which consists only of a few scattered lanterns. Price 3*s.* 6*d.*

C.P. 1007 : 1955. **Maintained Lighting for Cinemas.** This Code relates to the safety lighting and management lighting (as defined in Clause 102) in the auditorium, passages, stairways, and all other parts of cinema premises (other than those only subject to occasional use) to which the public have access. Some aspects of the general lighting of cinema premises are also considered.

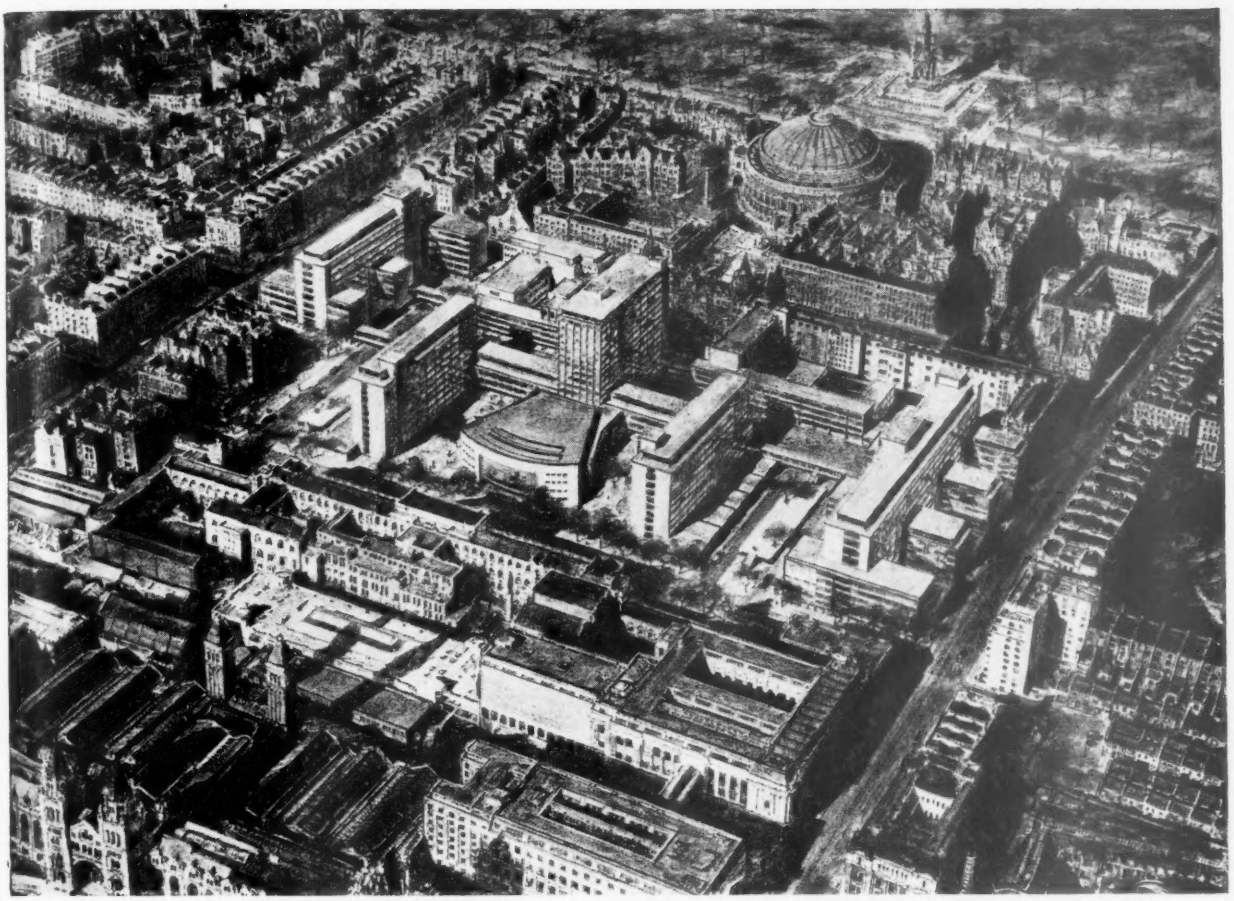
In premises for occasional use the recommendations of the Code should be observed as far as is practicable.

The Code does not deal with electrical or gas installation practice (wiring, pipe-fitting, etc.) and is not concerned with that part of the lighting of cinema buildings which serves solely for decorative or advertising purposes, nor with cleaners' lighting, nor with parts of the premises to which the public are not admitted.

The Code is obtainable at the British Standards Institution, price 5*s.* net.

British Standards Recently Published

B.S. 2717: 1956. **Glossary of Terms Applicable to Roof Coverings.** This glossary is one of a series connected with the building industry which the Building Divisional Council of the B.S.I. has undertaken to prepare. It embodies a definitive list of terms which it is hoped will be used in specifications and correspondence and when ordering materials so that understanding between the various sections of the building industry may be promoted and commercial transactions facilitated. Price 5*s.*



General view of the site and its surroundings showing the Albert Hall on the north and the Natural History Museum on the south

Imperial College Expansion

Architects: Norman and Dawbarn [*FF*]

THIS PROJECT, because it involves the destruction of Collcutt's Imperial Institute building, has become something of a *cause célèbre*. The R.I.B.A. JOURNAL cannot enter into its controversial aspect, any pronouncements of this nature being the prerogative of the Council as representing the general body of members. The following notes, taken from the official 'handout', are therefore purely descriptive.

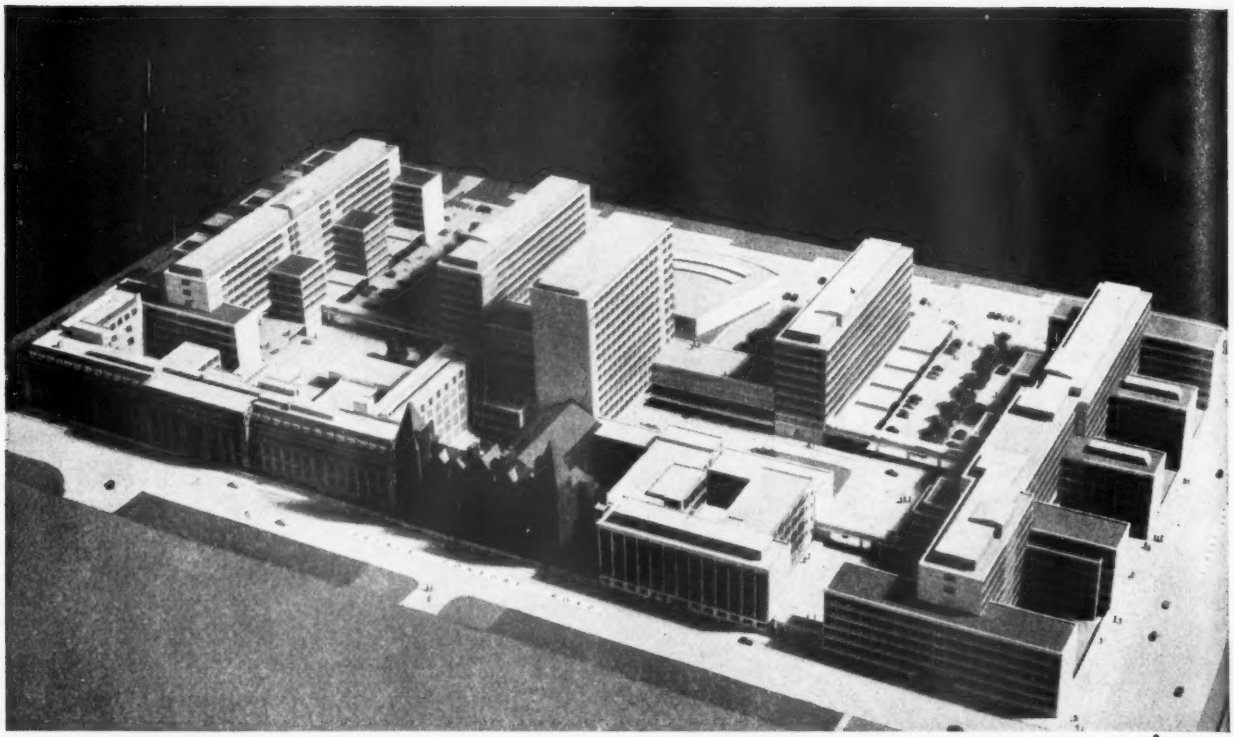
The Imperial College of Science and Technology, which is a School of the University of London, is made up of the Royal College of Science, the Royal School of Mines and the City and Guilds (Engineering) College. In 1953 the Government asked the College to raise its student numbers by the year 1962 from its present figure of 1,650 to 3,000. For this purpose the College was asked to plan on the basis of its taking over the island site within the rectangle bounded by Prince Consort Road, Exhibition Road, Queen's Gate and Imperial Institute Road.

The alternative of obtaining an entirely new site in the suburbs or in the country was investigated and rejected on the grounds that finding a suitable site of adequate size was difficult, that the capital cost would be greatly increased because of the need to provide residential accommodation and because expansion in South Kensington would retain the present close ties with learned societies and professional institutions. This decision was taken three years ago, since when nearly £1,000,000 has been invested in new buildings on the site.

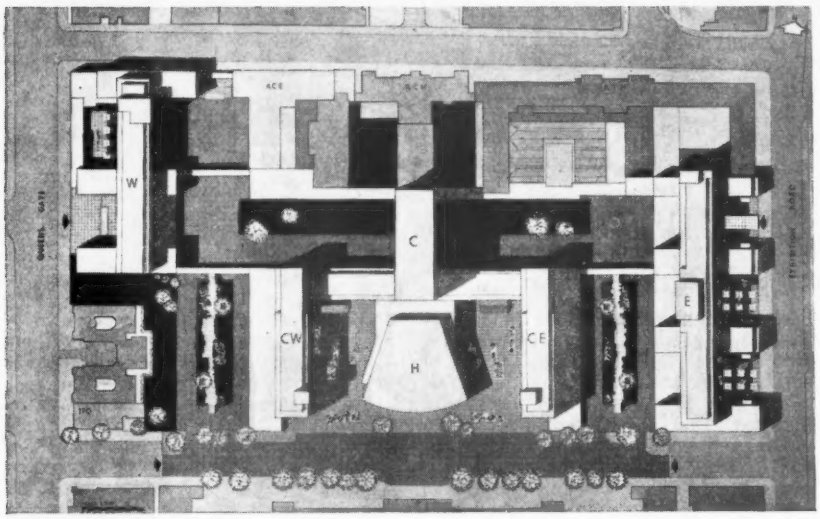
The College calculated that the gross floor area required was 1,800,000 sq. ft. This would give a space provision per person of about 340 sq. ft. or about 500 sq. ft. per student. Space requirements vary greatly according to technical equipment and these are average figures. The calculations also take account of the fact that the College has the highest proportion of post-graduates—who need more space than undergraduates—of any college or university in the country. Of the total requirement, about 340,000 sq. ft. can be provided by adaptations of existing buildings. About 1,460,000 sq. ft. of new floor space had to be found on the site.

The Engineering Departments will require about 750,000 sq. ft., the Science Departments 500,000 sq. ft. and the Mining Departments 175,000 sq. ft. A central building or 'nucleus' will provide the common rooms, refectories, libraries, etc. Residential buildings are to be provided nearby at some future time.

The College must be kept running during the building work, any demolition being carried out in planned stages. The existing buildings of the Royal School of Mines, the Goldsmiths' Extension of the City and Guilds Colleges and the Royal College of Music are to be left undisturbed. Also, at the request of the Royal Fine Art Commission, a Norman Shaw house at the south-west corner of the site is to be preserved; a block of privately owned buildings next it is also to remain. New buildings for chemical engineering and aeronautics,



The model from the north side showing buildings retained. From left to right, the Royal School of Mines, the Royal College of Music and now under construction, the Aeronautics Building



General plan of the site

planned under earlier schemes, are now under construction.

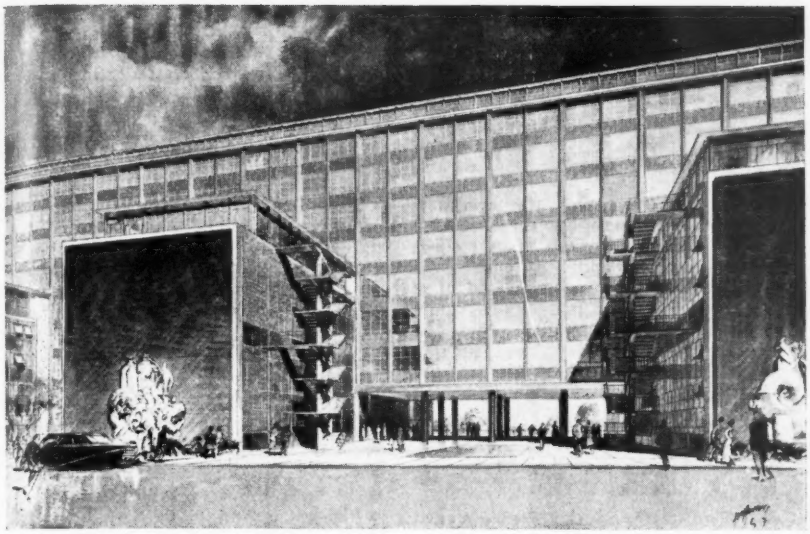
The buildings must of necessity be very large. While ground space is invaluable for heavy workshops, some of the buildings must be high in order to provide the required accommodation and to allow adequate sun and air in the buildings and in the spaces between them while avoiding monotony and over-shadowing.

The layout consists essentially of five spine blocks running north and south. Four of these blocks are to be 120 ft. high. The central block, which houses the sections used by all departments, is to be 200 ft. high with low wings on either side. This orientation of the blocks permits the maximum penetration of sun and air and provides vistas to north and south.

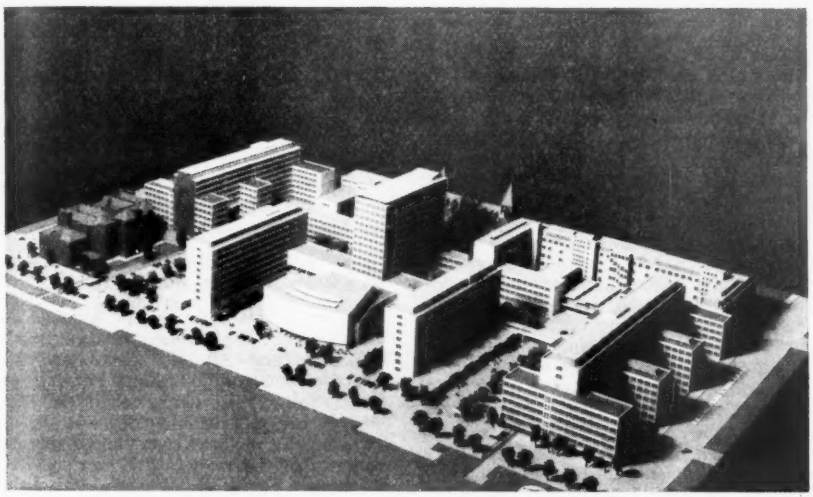
Some four or five thousand people will occupy the buildings and others will visit them. Abundant room for pedestrians and parking is therefore necessary. The wide spacing between blocks—200 ft. in some cases and 120 in others—allows ample space for paved terraces and gardens. There is a rise varying from 8 to 15 ft. from south to north of the site and this facilitates the provision of parking, which is partly under terraces and decks and partly in the open. It is hoped that Imperial Institute Road, which will be used by all vehicles approaching the college, will be absorbed as a precinct. It is so shown on the layout plan and model. The terraces for pedestrians from Exhibition Road and Queen's Gate are 85 ft. wide, which should be sufficient to take the great stream of students arriving in the morning and leaving at night. These terraces extend by decks and bridges to the various buildings. The vertical circulation has been equally considered in detail. The central nucleus block, which will have the greatest pedestrian traffic flow, has escalators as well as lifts. This block is readily accessible from all departments.

The plan and model show a great hall on the south side of the nucleus block. This was planned to hold 3,000 persons and to be accessible from various levels in the nucleus block as well as from outside. An alternative scheme for this portion is now being planned, one or more smaller halls being provided, together with other accommodation.

The plan and model represent the basic conception only. A great deal of detail planning remains to be done involving analysis, development and refinement. This



Left, the pedestrian entrance from Exhibition Road

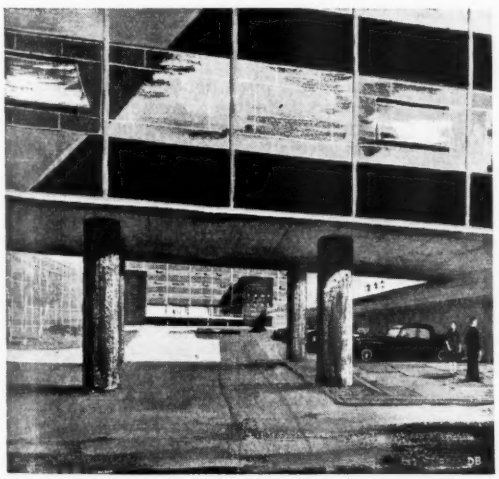


work is most advanced on block E (see plan) and the northern portion of block W. The remaining buildings have been planned diagrammatically to small scale but have not yet been brought to a stage at which the various approvals can be obtained and working drawings started. A programme has been set for the development of the scheme in a series of contracts, each dependent on the completion of previous work. Studies are in progress for a scheme of gardens and planting over the covered parking areas.

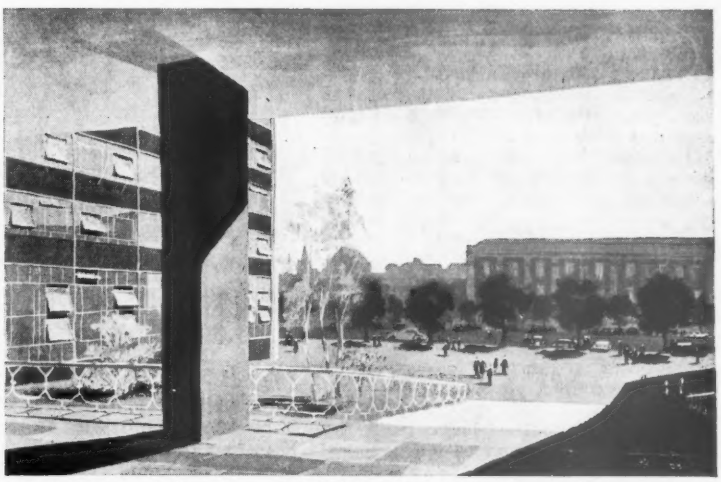
Regarding the Collcutt building, the official 'handout' says that studies were made to allow of its retention as a detached unit in a grassed surround but, because it runs east and west, it cut the site into two, impeding pedestrian and vehicle circulation and overshadowing new buildings to be provided on the north of the site. Moreover, much of its accommodation was not worth while and faced north. It was felt that its removal would permit planning of the site in depth with a sense of space and open the heart of the site to the south.

The retention of the central tower alone was also considered as an alternative. The factors against this were held to be that the scale and skyline, under any scheme, would of necessity be so altered that the tower would lose its significance; that because the tower springs from the roof it would need either part of the existing building or a new building round it; and that as a memorial without function it would be a self-conscious and irrelevant relic in a scheme serving a different age. There must be regret at the removal of a known landmark, but the responsibility would have been great and strong criticism justified if the efficiency and quality of the whole scheme had been prejudiced by its retention.

Left: general view of the model from the south-east. The great hall in the centre is being redesigned



View looking east at vehicle level to the central block



View looking south from the central building towards the Royal College of Science

Factors Affecting Economy in Multi-Storey Flat Design

By C. N. Craig, M.A. [*A*]

DURING RECENT YEARS flats have formed a steadily growing proportion of all new dwellings. Within this proportion, now about 25 per cent, the ratio of higher to lower blocks is also rising.

The need to re-develop large, and for the most part central, areas of cities calls for a significant reduction in the present costs of multi-storey flats. In view of the importance of this subject, the Building Research Station is carrying out a study of design factors and their influence on cost, particularly relating to blocks of six storeys and over.

The Scope of the Study. The scope of the initial study has been restricted to the relation between design, in all its aspects, and tender prices. The drawback of depending on prices rather than actual costs is appreciated and some at least of the wide variations in price which will be seen later may be partially accounted for by differences in local prices of materials. Nevertheless, useful inferences can be drawn from price trends and this method is in fact the only one by which a sufficiently large sample can be obtained in a reasonable time. It is intended however that a study of actual costs, erection techniques and organisation shall later be carried out.

Visits have been made to 21 London and 18 provincial housing authorities, the Department of Health for Scotland, the Scottish Special Housing Association and the offices of eight private architects, three consulting engineers and four quantity surveyors. Clerks of works on many sites and representatives of contractors and direct labour organisations have also given assistance.

The aim has been to obtain comparable data from all parts of the country regarding as many blocks as possible of six storeys and over. The 72 blocks in the sample are in fact representative of about two-thirds of recently built schemes containing high flats. Over fifty different authorities have provided information for the study.

Individual high blocks have been examined, irrespective of whether they are single examples or one of several blocks in a scheme. The price of work outside the perimeters of the blocks, in particular the price of site works, is not included. Site works can clearly include a variety of items which would confuse the picture since they may range from short service connections in a closely built-up area to the provision of roads, paths, gardens and longer connections, all shared with other buildings, in more comprehensive schemes.

All prices quoted are derived from the trade headings in the priced bills together with appropriate proportions of the miscellaneous items included as 'preliminaries.' No adjustment has been made for differences in dates of tenders as these were all approved during a period when records show that prices did not vary widely. All figures throughout this report may be taken as appropriate to the price levels ruling during the first quarter of 1955.

The survey covers 72 blocks ranging from six to twelve storeys, of which 55 are in the London Region and 17 in the provinces. They contain 3,747 dwellings, of which 865 or 23 per cent are maisonettes. The number of dwellings in each block ranges from 14 to 120, with an average of 52.

Forty-two of the blocks were designed by the architects of the respective authorities and thirty by private architects; in the majority of cases private engineering consultants were employed.

Block Prices. In order to make true comparisons between prices per sq. ft. and to assess real changes in price due to height it is necessary first to make allowance for differences in sizes of dwellings. The curve shown in Fig. 1 indicates the relationship between price per sq. ft. and size of dwelling; it is based on separate analyses of the blocks at each storey height in the sample. The vertical and horizontal lines intersecting the curve indicate the average dwelling size and the average price at that size respectively.

The variation in room heights is so slight that no adjustment has been considered necessary on this account.

Fig. 2 shows the extraordinarily wide range in the prices per sq. ft. of the dwellings in each of the 72 blocks. These prices have been adjusted on the basis of Fig. 1 so as to make them comparable at an area of 680 sq. ft. The averages of these prices at the different storey heights are shown in Table I.

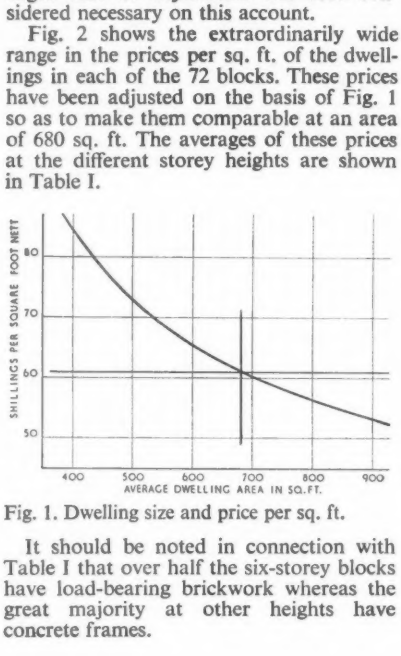


Fig. 1. Dwelling size and price per sq. ft.

It should be noted in connection with Table I that over half the six-storey blocks have load-bearing brickwork whereas the great majority at other heights have concrete frames.

There is no systematic relationship between price and the height of the building, certainly up to ten storeys. The rise in the average price of the eleven- and twelve-storey blocks is largely caused by a few exceptionally expensive cases (Fig. 2).

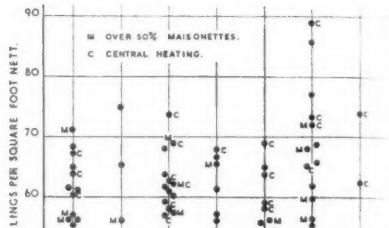


Fig. 2. Block prices per sq. ft. net

Breakdown of block prices. For the purposes of this investigation, the prices of all blocks in the sample have been broken down into the following main components or groups:

(i) *Substructure.* All foundation work up to and including ground-floor slab.

(ii) *Superstructure.* Frame and walls, including lift wells and chutes, structural floors, balconies and stairs; partitions; roof structure and roof buildings. Apart from foundations, this item covers all the 'heavy' work, virtually the whole of 'concretor' and 'bricklayer' and the great majority of the work which concerns the structural engineer. Where lightweight claddings or intermediate timber floors occur their prices have been included under this heading.

(iii) *Finishes and Fittings.* Roof and floor finishes with insulation; plastering; joinery; ironwork; windows; painting and glazing; electrical work; gas carcassing and mechanical ventilation, if any.

Table I

Storey height	Number of blocks	Prices of dwellings per sq. ft. net	
		Range	Average
Six	18	45*s.* 3*d.*–71*s.* 3*d.*	58*s.*
Seven	4	51*s.* 8*d.*–74*s.* 9*d.*	62*s.*
Eight	16	51*s.* 9*d.*–73*s.* 8*d.*	61*s.*
Nine	7	50*s.* 6*d.*–68*s.* 1*d.*	61*s.*
Ten	10	49*s.* 1*d.*–69*s.* 3*d.*	59*s.*
Eleven	15	51*s.* 7*d.*–89*s.* 2*d.*	67*s.*
Twelve	2	62*s.* 8*d.*–73*s.* 9*d.*	

Table II

Average Prices for all blocks

	Price	Percentage of total
Substructure	4*s.* per sq. ft. gross ..	8
Superstructure	19*s.* per sq. ft. gross ..	38
Finishings and Fittings ..	17*s.* per sq. ft. gross ..	35
Heating and Plumbing ..	£290 per dwelling ..	14
Lifts	£110 per dwelling ..	5
		100

(iv) *Heating and Plumbing.* Space and water heating; sanitary fittings, tanks, supplies, wastes and rain-water pipes. Central heating figures include for a share of the boiler house and equipment. In blocks having solid fuel heating an allowance of £70 per dwelling for flues and fuel stores has been taken from the 'superstructure' price and included under this heading. An allowance of £30 per dwelling has been made in the blocks having flues for gas fires.

(v) *Lifts.* Mechanical installations only. Although the cost of a lift well might safely be set at approximately a quarter of that of the lift itself, the actual costs are not readily abstracted from 'superstructure' since the walls often serve other purposes such as wind-bracing.

The terms used throughout this report for the different areas in blocks are:

1. '*Net area.*' The sum of all the individual dwelling areas in the block. Each flat or maisonette is measured within its containing walls, over and including partitions and chimney breasts, together with the private balcony if provided.

2. '*Other areas.*' The sum of all other areas in the block, only excepting that occupied by external and party walls. This includes halls, stairs, landings, balconies, lift wells, service rooms, communal rooms, private balconies and tenants' stores.

3. '*Gross area.*' The sum of 'net areas' and 'other areas.' Private balconies are included in 'net' areas because they represent an extension of private dwelling areas. Although balconies average 40 sq. ft. in size, the average inclusive size of dwellings with balconies is only 10 sq. ft. more than those without them.

In order to assess broadly the relative importance of the five main groups, their average prices for all the blocks are set out in Table II. It should be borne in mind that the heating and plumbing figure is an average, covering blocks both with and without central heating, and that the Substructure figure covers blocks with and without basements.

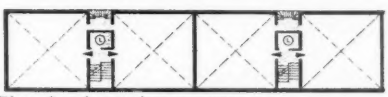
In the remainder of this report, as in Table II, costs of the first three components are expressed in shillings per sq. ft. gross and those of the last two components in pounds per dwelling. Costs of substructure, superstructure and finishes are related in the main to the area of the whole block, irrespective of the space allotted to access or the sizes of the individual dwellings. Heating and plumbing and lifts on the other hand are related to dwellings rather than to floor area.

PLANNING

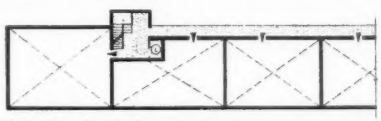
Block shapes.—Approximately half the blocks in the sample are rectangular 'slabs' varying from 80 ft. to 330 ft. in length and 24 ft. to 33 ft. in depth. Apart from four square 'point' blocks the remainder are irregular in plan, being either U, L, T or Y shaped.

Other factors intervene to obscure any correlation between prices and plan shapes, but the latter clearly influence the ratio of gross floor area to external wall area. A high ratio can be of benefit by reducing costs and heat losses providing it is not carried to the extent that daylighting is impaired. It was found that this ratio varied from 0·94 to 1·58, with an average of 1·20 for the rectangular slabs, and from 0·70 to 1·40, with an average of 1·12, for the remainder. The four square point blocks show ratios of 1·40. As might be expected, the depth of a slab block or wing of an irregular block was found to have a greater effect than its length on this ratio.

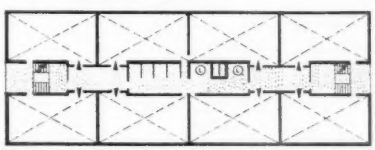
The distinction between 'point' and 'slab' blocks is now becoming obscure and the terms are convenient rather than precise. For purposes of planning economics the only significant distinction between blocks is in fact that between balcony and staircase access. In this connection it is convenient to define staircase access blocks as those in which it is possible to reach the entrances of all dwellings from the lift and staircase without passing the windows of any other dwelling.



Plan showing staircase access



Plan showing balcony access



Plan showing staircase access with internal corridors

The two main forms of access.—All the 'point' blocks in the sample naturally have staircase access, but seven rectangular 'slab' blocks also have this form of access serving two flats per floor. The type of access for dwellings in high blocks is determined not only by plan shape, but also by considerations of amenity and provision for escape from fire.

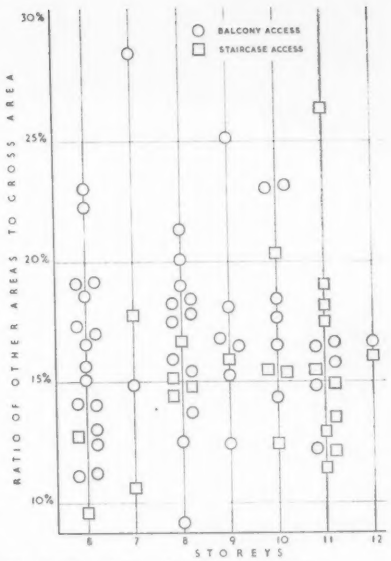


Fig. 3. Planning ratios of upper floors

The most important disadvantage of balcony access, especially at great heights, is the exposure to wind and driving rain. Balconies are a likely source of noise and inevitably involve a loss of privacy, especially when either link or continuous escape balconies are also required. Freedom of planning with this form of access is curtailed by the need to keep both bedrooms and living room away from the public side and the difficulty in having kitchen or bathroom windows opening over the balcony. Balconies cantilevered from floors can cause concentrations of eccentric loading. Balcony access is also difficult to handle architecturally and many of the solutions are liable to lead to a considerable amount of external painting.

In some examples of staircase access the landing is fully enclosed, in which case two staircases have usually been required. In others the landing is fully or partially open at either end and in some of these one enclosed stair has been allowed. Although the through-ventilated landing provides greater protection from the weather than balcony access, draughts are almost inevitable. Staircase access, particularly the fully enclosed type, is preferred by tenants; it is in fact insisted on by some authorities and is widely used on the Continent.

One block in the sample has a short internal corridor; for purposes of this study it has been included under 'staircase access'. Internal corridor access can permit 'double depth' blocks and therefore high ratios of floor to external wall area. A greater number of dwellings can clearly be planned in a given length of block and consequently wider block spacing is possible for a given density. With corridor access however careful orientation of the

Table III

Planning Ratios and Dwelling Prices

Number of blocks	Access type	Planning ratios		Prices per sq. ft. net	
		Average	Range	Average	Range
48	Balcony	17·0%	9·1–28·7%	60*s.*	45*s.*–89*s.*
24	Staircase	15·4%	9·7–26·4%	64*s.*	49*s.*–77*s.*

blocks is essential if amenity is not to suffer.

The relative costs of staircase and balcony access blocks are shown in Table III. The prices of ten staircase access blocks fall below the average for balcony access blocks. It has not been possible at this stage to analyse the numerous different fire escape provisions in the sample. There is a diversity of practice throughout the country and undoubtedly a need for unification in this field.

Net and gross areas. The total amount of 'other areas' in blocks depends not only on the planning of the upper floors but also on ancillary requirements at roof, ground floor and sometimes basement levels. All blocks in the sample have therefore been taken together for this purpose and show a range from 11 per cent to 35 per cent, with an average of 21 per cent for 'other areas' as a percentage of gross block areas.

A more important index on which all blocks can fairly be compared is what might be termed the 'planning ratio', that is the percentage of the gross area of a typical upper floor which is occupied by 'other areas'. The economy of reducing upper floor access areas to the minimum is emphasised by the requirement that public areas shall be capable of carrying 60 lb. per sq. ft. as against 40 lb. within the dwellings. The planning ratio of a typical upper floor is an important index of planning efficiency; Fig. 3 and Table III show the varying levels of achievement throughout the sample.

The general average for planning ratios can be seen from Table III to be 16 per cent. It is perhaps interesting to note in this connection that if, for example, a planning ratio of 26 per cent in a ten-storey block is reduced to 16 per cent, the resultant useful space gained would equal that of the whole of one floor. The difference between this figure and the average for all other areas of 21 per cent mentioned above is of course due to the inclusion in the latter of lift motor and tank rooms, entrance halls and stores, etc., at ground level, and of basements in 25 per cent of the blocks.

Twenty-five blocks of all heights and types in this sample have a ratio of 'other areas' to gross area of the block of 18 per cent or less and this figure can therefore be taken as one which need not be exceeded in blocks without basements. It is a figure which has been considerably improved on in some blocks and one which leaves scope for the inclusion of adequate tenants' stores and communal facilities.

The disposal of lifts within blocks. The numbers of dwellings per lift are shown in Table IV. For this purpose the total number of dwellings in the block has simply been divided by the number of lifts in the block. In view of the possibility of a lift being temporarily unavailable owing to breakdown, overhaul or furniture removal, the choice of two lifts is a useful amenity, especially in higher blocks. In some blocks a pair of lifts is provided, each stopping at alternate floors; this condition has been counted as a 'choice of two' lifts. In other cases, access can be had to an alternative lift across the roof but this has not been counted as providing a choice.

Fig. 4 shows lift costs per dwelling for the various blocks. The installation costs of the one or more lifts in each block are divided by the total number of dwellings in the block.

Use of Ground Floors. In the great majority of blocks, small flats occupy most of the ground-floor area. While this may be strictly the most economical use of the space, ground-floor dwellings in large blocks are almost inevitably noisy and lacking in privacy. There is much to commend the practice, more common on the Continent, of putting stores and ancillary or communal rooms or even shops and offices on the ground floor. By leaving ground floors partially open, two most important and hitherto largely neglected facilities can be provided, namely covered space for parking and children's play.

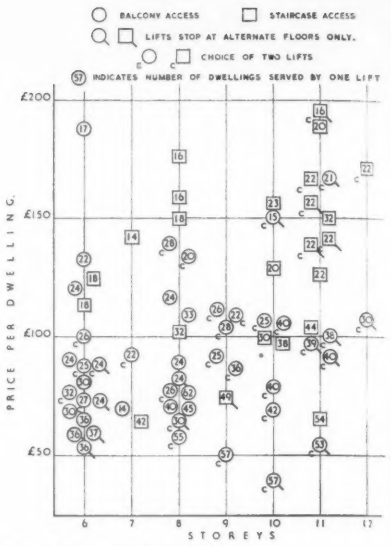


Fig. 4. Lift costs per dwelling

Refuse disposal. With the exception of the two cases which have the Garchey system, and three blocks which have bin disposal, all blocks in the sample have dry chutes of glazed stoneware pipes. In most cases these appear to be reasonably satisfactory although the hopper doors are often inadequate in size and are noisy.

Chutes are not provided within individual dwellings; in most cases they are in the vicinity of the lift hall or stairs. In one ten-storey block however chutes are available on private balconies. The distance over which refuse, possibly including ashes, has to be carried to the chute along exposed

Table IV

Availability of Lifts

Storey height	In balcony access blocks				In staircase access blocks			
	Numbers of blocks	Dwellings per lift		Choice of two lifts	Numbers of blocks	Dwellings per lift		Choice of two lifts
		Range	Average			Range	Average	
6	16	17–37	28	5	2	—	18	—
7	2	14–22	18	1	2	14–42	28	—
8	12	20–62	34	6	4	16–32	20	—
9	6	25–57	32	6	1	—	49	—
10	6	15–57	36	6	4	20–38	28	—
11	5	22–54	38	5	10	16–54	28	5
12	1	—	30	1	1	—	22	1
All Heights	48	14–62	32	30	24	14–54	26	6

Table V

Numbers of rooms and sizes of dwellings

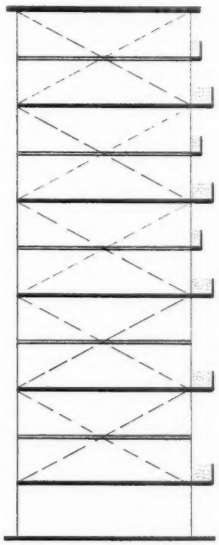
Number of dwellings	Percentage	Type	Average size	Range
215	6	One room	349 sq. ft.	250–472 sq. ft.
814	22	Two room	506 sq. ft.	392–615 sq. ft.
2,131	57	Three room	709 sq. ft.	500–787 sq. ft.
584	15	Four room	846 sq. ft.	658–1,114 sq. ft.
3	—	Five room	1,030 sq. ft.	—

balconies is in several cases as much as 40 yards and in one case 60 yards. The number of dwellings per chute varies from 9 to 50 with an average of 22.

Noise in flats. Apart from noise from balconies and surrounding areas, three of the disturbing noise sources are chutes, stairs and lifts. Although it is possible to quieten refuse hoppers with rubber seatings it is difficult to prevent the noise of falling objects ricocheting against the chute sides. Escape stairs, though primarily intended for use during a fire, are often used for general traffic and being of concrete are inevitably sources of noise. Lifts again, though almost silent in themselves, are a natural focus of noisy traffic. From the point of view of noise the ideal arrangement should be to isolate these components from the structure, but this is not often possible for lifts and stairs, although it should be possible for chutes. Bedrooms are naturally most affected by noise of this kind. Throughout the sample, in eleven cases bedrooms adjoin chutes, stairs and lifts; in 27 cases designers have been successful in keeping bedrooms away from all three. In 34 cases bedrooms adjoin one or two of these noise sources.

Sizes and planning of dwellings. Table V shows the total number and sizes of dwellings throughout the sample together with their percentage representation. In describing the size of a dwelling, bedrooms and living-room only are counted; i.e. a three-room dwelling has a living room with two bedrooms and a one-room dwelling has a bed-sitting room. There is a tendency in the sample for the average size of dwelling to fall slightly in the higher blocks. Room heights are on average 8 ft. 1 in. and storey heights 8 ft. 9 in.

Maisonettes. In 15 out of the 72 blocks, maisonettes represent over 50 per cent of the dwellings in the block. Their disposition and prices may be seen in Fig. 2. The average price per sq. ft. net of dwellings in these blocks is 61*s.* and in the blocks containing wholly or mainly flats it is 62*s.* (all prices being adjusted to a standard size of 680 sq. ft.).

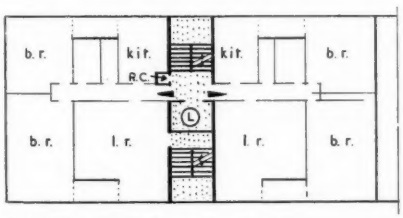


Typical section through maisonettes

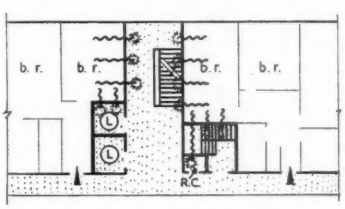
One of the economic benefits claimed for maisonettes is that advantage may be taken of the reduced load, fire resistance, and sound insulation requirements for the intermediate floors to enable timber to be used and thus to reduce the load on the foundations. Despite this, out of the 15 blocks only three have timber intermediate floors.

The saving in alternate access balconies is to some extent offset by the need to provide alternative escape balconies to bedroom floors which are over 42 ft. above the ground. No blocks of maisonettes with staircase access were found in the survey.

The designers claim that the majority of the occupants of maisonettes prefer them to flats for a variety of reasons, in particular because of the added privacy and quiet which they can afford.



Bedrooms away from noise sources



Bedrooms adjoining noise sources

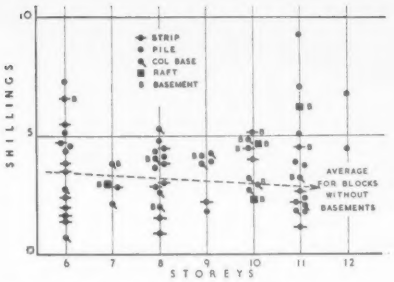


Fig. 5. Substructure prices per sq. ft. gross

Internal planning. Dwellings in the sample naturally display a variety of different internal plans. Through living rooms have been adopted in a few cases but many authorities will not accept this type of plan for reasons of amenity and fire escape. In two blocks, dining kitchens have been provided and in the remainder, working kitchens only.

There is generally a shortage of storage space within the dwellings themselves which cannot satisfactorily be replaced by the provision of tenants' stores on the ground floor or elsewhere. Such stores are suitable only for bicycles and similar less 'personal' items; out of the 72 blocks they are known to be provided in 48 cases. Of these 10 are in basements, 24 on ground floors, 6 on the landings and 8 outside the block.

Artificially ventilated inner rooms. Ventilated inner bathrooms and W.C.'s occur in eight blocks but are likely to be increasingly used in order to conserve outer wall space. These inner rooms are almost universal on the Continent and are very common in America. The cost of mechanical ventilation is often considered to be offset by savings in structure, planning and external walls, although in many cases shunt vents without mechanical extraction are working satisfactorily. American experience of flats in corridor access blocks with mechanical extract ventilation from inner bathrooms and W.C.'s suggests that if anything ventilation conditions are better than in blocks with these rooms on external walls.

Private Balconies. Seventy per cent of the dwellings in the sample have private balconies. They range from 10 sq. ft. to 95 sq. ft. in size with an average of 41 sq. ft. In the majority of cases balconies are inset; the greater protection and privacy which this type affords is generally appreciated.

Balcony fronts present many problems. Solid balustrades are cheapest to maintain and possibly to build but tend to be ponderous in appearance. It is desirable that children should be able to see out and down without climbing the balustrade but at the same time an upstand is required to prevent objects rolling over the edge. The fronts used in the blocks in the sample include metal (29), concrete (16), glass (13), brick (9) and hardwood (1).

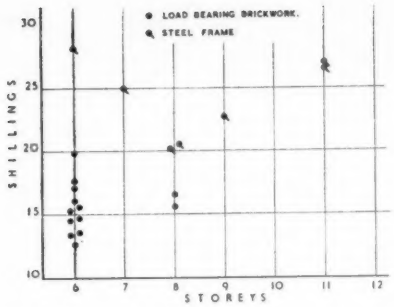


Fig. 6. Superstructure prices per sq. ft. gross (brickwork and steel)

Laundry and drying facilities. The tendency has been away from the large communal laundry and towards facilities which approach home laundering. The disadvantage of the latter in flats lies in condensation problems and the lack of space. The most common compromise is the utility room serving between five and ten dwellings and having a washing machine, copper, sink, draining board and mangle. The most important provision is that of drying facilities; in 19 cases this provision is made in communal rooms and in 24 blocks gas or electric cabinets are provided in the dwellings. In 29 cases no special provision is apparent either in the dwellings or the blocks.

SUBSTRUCTURE

Table II shows that substructure accounts on average for 8 per cent of total block prices. The variation in this price can be seen in Fig. 5 which also shows the average price for blocks without basements. Since the cost of the substructure is spread over the total floor area it is perhaps surprising that the costs do not fall rather more steeply with increasing height of block.

The types of foundations used are shown in Table VI together with the ranges of depths below ground level where these are known. In 18 cases, the blocks have basements.

Table VI

Foundations

Number of blocks	Foundation type	Range of depth
26	Strips	4 ft.–14 ft.
22	Piles	21 ft.–40 ft.
16	Column Bases	4 ft.–14 ft.
5	Rafts	4 ft.–18 ft.

Site conditions largely beyond the designer's control clearly have a major influence on substructure costs. However, it would appear that some foundation designs are inherently more economical than others. Fig. 5 shows that 27 blocks without basements had substructure prices below 3*s*. per sq. ft. gross, and it is reasonable to assume that except on very difficult sites this figure need not be exceeded.

Table VII

Types and Prices of Concrete Structures

Number of blocks	Type	Average price per sq. ft. gross	Range
30	Reinforced concrete column and beam	19*s*. 9*d*.	13*s*. 0*d*.–34*s*.
16	Reinforced concrete walls	19*s*. 10*d*.	14*s*. 6*d*.–31*s*.
5	Reinforced concrete composite ..	18*s*. 7*d*.	12*s*. 4*d*.–24*s*.
1	No-fines load-bearing walls	12*s*. 8*d*.	12*s*. 8*d*.

SUPERSTRUCTURE

Of the 72 blocks, 13 are in load-bearing brickwork, 7 have steel frames, 51 use dense reinforced concrete and one is in load-bearing no-fines concrete throughout.

The prices of the load-bearing brick and steel frame superstructures are shown together on Fig. 6.

Load-Bearing Brickwork. Load-bearing brickwork is commonly used in six-storey buildings but the two eight-storey blocks are exceptional. Although the prices shown are competitive with concrete structures, it appears unlikely, at present, that many blocks over six storeys high will be built in load-bearing brickwork owing to the high degree of supervision required to ensure that the brickwork is to adequate engineering standards.

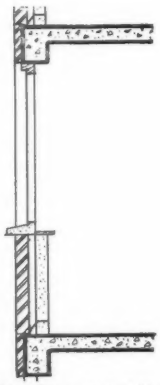
Steel framed structures. In several of the steel framed constructions it is understood that this form was adopted because of a shortage at the time of steel bars for reinforcement. The cheapest of these structures has a modified Mopin type frame employing only two-thirds of the steel normally used for more conventional structural steel designs.

The main advantage claimed for steel is that it provides an accurate template for rapid building. When the work involved in casing for fire protection is taken into account however the advantage over a concrete frame is reduced, and in the opinion of some engineers removed altogether. Unlike factory or office buildings, blocks of flats must have substantial subdivisions at frequent intervals. To achieve this with a steel frame must entail three distinct processes; first the steel erection, second the casing and third the infilling between encased stanchions. In view of this inevitable complexity, the fact that beam and stanchion casings so often obtrude into rooms and the comparatively high prices shown in Fig. 6, it does not appear that steel frames are a particularly attractive form of construction for multi-storey flats.

Concrete Structures. The numbers of blocks employing the different forms of concrete superstructures, together with their average prices and ranges, are given in Table VII.

For the purposes of this study a 'composite' structure is defined as one in which both load-bearing concrete walls and columns are used; a predominantly column and beam type of construction with concrete walls to lifts and stairs only is not included in this category.

Four examples of 'no-fines' infilling to a



Traditional cladding

structural frame are included under the 'column and beam' heading in Table VII. Their prices are near the average for column and beam systems and in principle they differ little from them.

The disposition of the four main concrete structural types, by storey height and price, is shown in Fig. 7. The wide variations to be seen in both Figs. 6 and 7 may in part arise from the differences in structural efficiency but no attempt has been made to assess this in this particular study. The price of the one load-bearing ten-storey 'no-fines' structure can be seen to be almost as cheap as the best of the dense concrete types and, since this is only the first of its kind to be erected in Britain, it clearly constitutes a challenge to them.

It is clear however that during the immediate future the majority of high blocks are likely to be built in reinforced dense concrete.

The structural problems arising from

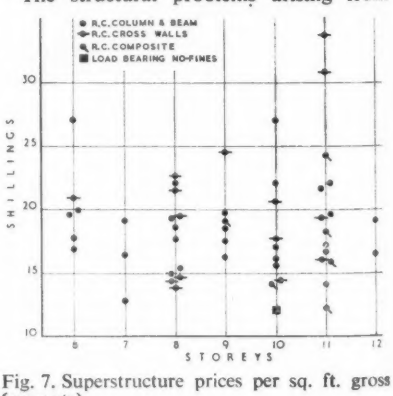
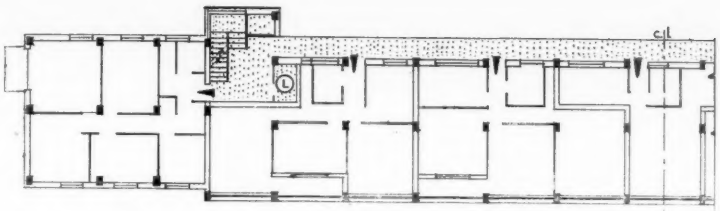
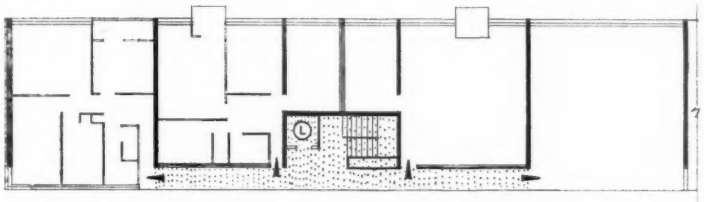


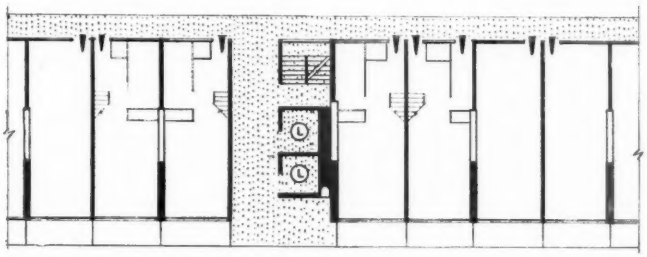
Fig. 7. Superstructure prices per sq. ft. gross (concrete)



Column and beam construction



Cross-wall construction, widely spaced



Cross-wall construction, closely spaced

openings in load-bearing external walls in high buildings and the fact that light materials are more suitable for thermal insulation has led naturally and almost universally to the loads being carried within the building rather than by external walls. This is done either by a system of columns and beams or by cross-walls or by a combination of the two.

In cross-wall structures stability across the building is inherent in the walls themselves, which require no extra thickening for this purpose and in some cases may not be reinforced at all; longitudinal stability is provided in some twelve cases in the sample by the lift and staircase walls. Generally however adequate strength and stability can be obtained by the use of any of the three main dense concrete types and Table VII shows that there is little to choose between them in price. In the light of the information gained during the survey therefore it appears that choice of superstructure should depend on fulfilment of the remaining functional requirements, as follows:

Weather resistance and thermal insulation. In high flats, resistance to the weather and the provision of thermal insulation are both primarily connected with the main elevations. Thermal insulation between any dwellings on the ground floor and the ground is usually catered for by the solid floor; insulation of the roof above the uppermost dwellings is not always so satisfactory.

Although it is perhaps easier to obtain good thermal insulation with a light-weight cladding, this form has been slow to evolve. Undoubtedly this is due mainly because of expected higher first cost but partly also because weather-proofing is not so easily achieved as with a homogeneous skin such as brickwork.

Of the 72 blocks, four have light-weight claddings. The majority of the remainder have cavity external walls of 4½-in. brick and clinker block inner skins; the load-bearing capacity of brick is not utilised in panel walls and only adds weight to the structure. This extra weight demands an edge beam which would in many cases not otherwise be necessary; such edge-beams prevent the use of full-height windows (unless upstands are used) and complicate the construction process. It appears that there is a good case in high blocks for light-weight claddings coupled with the elimination of edge beams and consequently for cross-wall rather than column and beam construction.

Sound insulation. In respect of sound insulation, cross-wall structures have advantages over column and beam types. Satisfactory insulation requires a density of 90 lb./sq. ft. which is equivalent to 7 in. of concrete; generally a satisfactory thickness from the structural standpoint for cross-walls. Equivalent performance cannot easily be gained by infillings between columns. Nine inches of brickwork is uneconomic when it serves no

Table VIII

Party Wall Infilling

Number of blocks	Party wall infilling between columns	Overall thickness excluding plaster
8	Solid brickwork	9 in.
1	Solid brickwork	13½ in.
2	Cavity brickwork	11 in.
3	Cavity block-walling	6 in.
3	Cavity block-walling	8 in.
4	Cavity block-walling	12 in.

structural purpose; cavity methods are less effective. With any infilling, edge cracks are liable to develop. Party wall infillings in column and beam structures are shown in Table VIII.

The technique of infilling between columns with no-fines concrete has the advantage of presenting a comparatively homogeneous surface for plastering and eliminating unsightly breaks. Whether this justifies rather thick partition walls at limited spacings and the necessity for external rendering is an open question.

Fire resistance. Fire resistance is of particular importance in the design of high flats. If any outbreak of fire can be confined with reasonable certainty to one dwelling, not only is the safety of the occupants of all the others in the block assured, even when within their dwellings, but in all likelihood economies can be made in the provision of various means of escape.

Structurally, barriers must be provided against fire from other contiguous flats and from outside. Concrete structural floors of the minimum thickness of 5 in. necessary for sound insulation are adequate against fire. External panel walls require to resist the intrusion of flames from a window below, and here brick claddings as now widely used are satisfactory but the newer light-weight claddings present some problems. Party walls between dwellings must be highly fire-resistant and in this case hollow infillings between columns can and do give

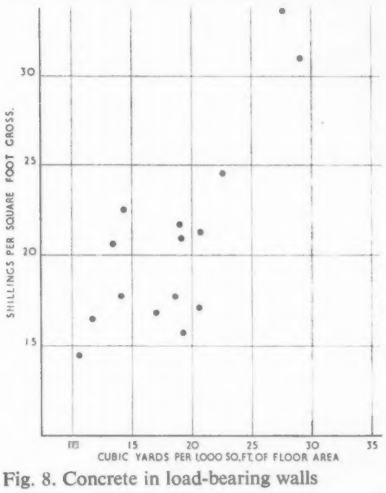
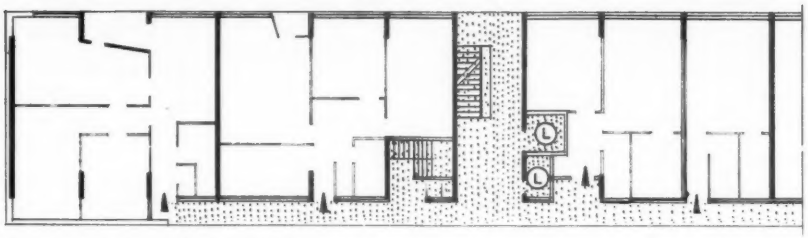
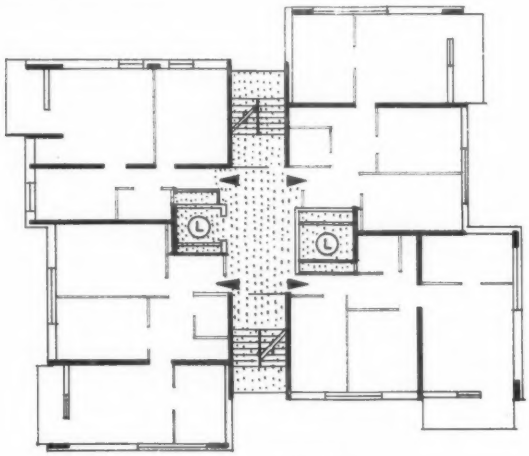


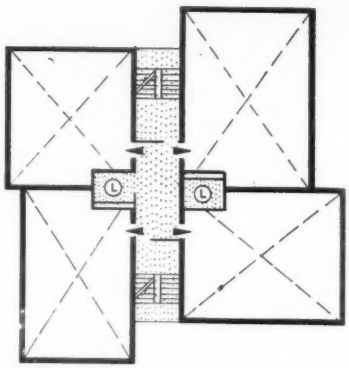
Fig. 8. Concrete in load-bearing walls



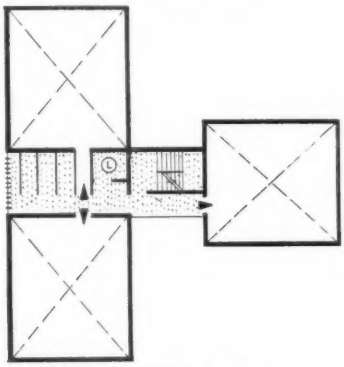
One form of composite construction



Another form of composite construction



Fully enclosed staircase access



Partially open staircase access

the statutory minimum protection, but solid concrete walls can give considerably longer protection at no greater overall price.

Ease of erection. At the present stage of development of construction techniques for high flats it can be said that a structure of cross-walls is certainly no more difficult —many would say easier—to handle than one of columns and beams. The isolation of shutters for in situ columns makes the provision of safe working platforms around them uneconomic, and the congestion of steel within them can make consolidation of the poured concrete difficult. Less labour is involved in setting out walls than columns, and the formwork is generally easier to fill.

For spans within the capacity of economic precast floor units, the use of in situ cross-walls and fully precast floors is of value in providing an immediate working platform and eliminating all horizontal shuttering. Stair flights have also been precast in a number of cases, with advantages in speeding up erection, eliminating awkward shuttering and giving immediate access to the work level.

The advantages of precasting are numerous but it has not so far been widely used in flats and there is no direct evidence of significant reductions in cost. The undoubted economies which remain to be made in all construction processes depend to a great extent on detailed consideration of erection techniques at the design stage.

Adaptability to planning requirements. It is often claimed that cross-wall construction inhibits planning although no obvious example of this was found among the blocks in the sample. Column and beam frames clearly permit considerable freedom for planning, but whether such freedom is really necessary for such comparatively small and well-defined units as flats is open to question; especially as identical dwellings can well be repeated vertically without impairing variety horizontally, if required. As with steel, concrete columns and beams are likely to obtrude into walls and ceilings of rooms and passages; this disadvantage is evident in many cases. In some of these the party wall infilling—in order to maintain a flush surface—is considerably thicker than a solid cross-wall would have been. Various types of party wall infilling used are given in Table VIII in the cases where these details are known.

Conclusions on choice of superstructure. It can be seen that there are good reasons for the choice of a superstructure within which the party walls are of concrete throughout. In the case of plain rectangular blocks such walls can well form the whole of the load-bearing structure; with more complex point blocks, these walls can be supplemented by columns, particularly for example at external corners.

For the most common slab type blocks certain principles can be established which in part would apply to more complex blocks. Continuity in floors is desirable and equal spans, though not essential, lead to economy in building.

A tendency is evident towards thinner structural floors in spite of the inevitable sacrifice of reasonable sound insulation; already ten blocks in the sample employ floors of only 3½ in. to 4½ in. thickness. Since concrete structural floors should be a minimum of 5 in. thick for sound insulation, and spans may generally be considered as 36 times the floor thickness, spans of less than 15 ft. would not appear economic. At this spacing reinforcement in walls needs only to be minimal.

Table IX

Structural Floors

Number of blocks	Floor type	Range of depths	Range of spans
46	Solid in situ	3½ in.–8 in.	8 ft.–22 ft.
14	Hollow pot	5½ in.–7 in.	10 ft.–17 ft.
7	Prestressed	3 in.–8 in.	12 ft.–27 ft.
5	Precast	5½ in.–7 in.	11 ft.–15 ft.

Table X

Gable Ends

Numbers of blocks	Type of gable end cladding	Gable structure
34	Brick	Reinforced concrete or steel frame
12	Brick	Load-bearing brickwork
6	Concrete slabs	Reinforced concrete walls
3	Concrete slabs	Reinforced concrete frame
1	Concrete slabs	Load-bearing brickwork
4	No-fines concrete rendered	Reinforced concrete frame
1	Concrete painted	Reinforced concrete walls
1	Tiles	Reinforced concrete walls

The minimum 7-in. wall thickness needed to satisfy sound insulation requirements will usually suffice for spans of 20 ft. or even 25 ft. for blocks up to say ten storeys in height. At these spans floor thicknesses need normally increase only to about 6 in. and 8 in. respectively. The commonest grid spacing for column systems in the sample was found to be 12 ft. and the widest 18 ft. The types of floors used, together with spans, are shown in Table IX.

Comparatively widely spaced cross-walls can reduce total weight to the minimum necessary for lateral sound insulation between dwellings, save concrete and—all-important—save shuttering.

Fig. 8 shows the relationship between quantities of dense concrete in load-bearing walls and total superstructure costs for the blocks in the sample having this form of construction. In this figure the quantity of concrete in the walls is expressed in cu. yds. per 1,000 sq. ft. of gross floor area for a typical storey. The superstructure prices shown do, of course, include floors and partitions as well as the walls themselves.

The quantities of concrete used to fulfil similar minimum requirements vary widely; the lowest amount is used in a case where all party walls are in dense concrete. In some cases concrete has been used not only in cross-walls but also in spine walls, partitions and even as an inner skin to outer walls. It would seem that in structures employing concrete walls around 12 to 15 cu. yds. of concrete per 1,000 sq. ft. of gross floor area should usually suffice.

The ten lowest priced superstructures in Fig. 7 comprise blocks of varying shapes with both balcony and staircase access and thus represent between them a cross-section of block types. It is therefore reasonable to expect that at the present stage of development in technique, the superstructure of a high block of flats need not cost more than 15*s.* per sq. ft. gross.

Four less important elements of superstructure. (1) *Stairs.* It has not been possible to abstract the prices of individual stairs but clearly their disposition and number have the most influence on their costs. The number of dwellings per staircase varies from 7 to 105 with an average of 28 for the 72 blocks. The great majority of stairs are of in situ construction with granolithic finish. 'Scissor' stairs, in which two entirely independent flights run in the same well, have been used in two cases in the sample.

With the steady improvement in the reliability of lifts, staircases in high blocks are needed mainly for fire escape and thus do not require a high degree of finish; indeed in many cases stairs are isolated from landings by self-closing doors. General agreement has been found on the contention that if storey heights could be standardised at two or at the most three alternatives it would be possible to produce precast flights which could be used in many types of blocks.

(2) *Partitions.* The number of blocks employing various types of partitions are as follows: clinker blocks (57), hollow clay blocks (8), proprietary types (4), stud and plasterboard (3). There is no evidence of the use of dry fully-finished types of partitions. The proprietary types in the sample employ gypsum planks and although these require plastering on both sides they have certain erection advantages and are claimed to be economical.

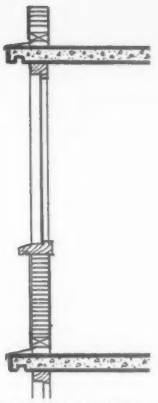
(3) *Gable ends.* Gable ends present a difficult problem, especially where it is desired to use claddings other than brick. In at least one case in the sample the end walls have been replaced with a column and beam framework which is clad with concrete slabs and finished internally with two skins of clinker block; this is considered to be an interim solution only. Two of the greatest problems which need consideration with precast facing slabs are handling during erection and moisture penetration.

The types of external claddings to gable ends, together with the framing behind, are shown in Table X for other than point blocks in the sample.

Table XI

Finishings and Fittings

	Prices of finishings and fittings as percentage of total
Joinery	9
Plasterwork	7
Floor finishes and insulation	5
Painting and glazing	5
Windows	3
Electrical	3
Ironwork	2
Roof finish	1
	35



Lightweight cladding

(4) *Roof structures and roof buildings.* Most blocks in the sample have flat roofs; only four have pitched roofs, of which three are tiled and one is metal.

The need for lift motor rooms, extensive tank rooms, in some cases provision for ventilating plant and numerous ducts, chute heads and pipe runs, adds to the complexity of the roof, and the economy of covering so many dwellings with one roof is to some extent reduced. Roof buildings of this type are not only expensive but difficult to handle architecturally. Their elimination would reduce costs and leave a worth-while expanse of flat roof which could then be put to some useful purpose. Maisonettes open the way for lift motor rooms to be placed in the top storey, but water regulations would require amendment before tank rooms could be dispensed with.

On the Continent several high blocks have been built with pitched roofs, and although the aesthetic problems may be very real, pitched roofs clearly have certain advantages. They may have a lower first cost and longer life and allow space for tanks, pipe runs and motor rooms.

FINISHINGS AND FITTINGS

The work in finishings and fittings accounts for 35 per cent of the total cost per flat. The various items involved together with their relative importance are shown in Table XI.

Certain of the items included in finishings and fittings present no special problems and no comment is therefore made on them in the following paragraphs.

Floor finishes and sound insulation. Fifty-six blocks have thermoplastic tiles and eight a jointless finish. These types are normally laid on a screed. The screed clearly has some value for insulation but its weight can be quite formidable, running to several hundred tons in an average-sized block. This disadvantage is of course absent with timber finishes, in which some further economy can be made by the use of quilt strips under each batten only rather than over the whole structural floor. Eight blocks in the sample have timber floor boards.

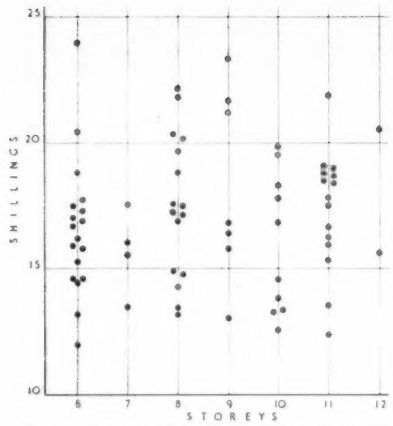


Fig. 9. Finishings and fittings per sq. ft. gross

There appears to be little difference in price between boards on battens and quilt or tiles on screed and quilt. The former probably give slightly better sound insulation and allow electrical runs to be inserted at a relatively late stage of construction.

Quilt is used in most cases for insulation but there are ten examples of light-weight concrete screed. There are also single examples of wood wool, cork, insulating board and sand. In view of the importance of sound insulation in flats and the difficulty of inserting it once the floor finish has been laid, it is regrettable that in 16 blocks no quilt or other insulation has been provided.

Windows. Forty-nine blocks have steel windows, 29 use wood and one has aluminium casements. The particular problems associated with windows at a great height are draught prevention, need for foolproof catches to prevent swinging in high winds and facilities for cleaning, reglazing and general maintenance. At least one authority has developed a centre-hung window which can be reversed for cleaning. This represents a useful advance, but in general these problems have not been satisfactorily solved. The need for controllable ventilators in flats, particularly to combat condensation in kitchens, may well be met by incorporation of some device in windows; permanently open vents are generally found to be serious sources of draughts.

Finishes to flat roofs. Many high blocks have bitumen felt with a top dressing; others have asphalt. Well-laid felt is usually considered satisfactory but is of course more difficult than asphalt to combine with flashings around the numerous obstructions.

Conclusions on Finishings and Fittings. Specifications for finishings in flats do not appear to differ widely but visits to a number of blocks reveal that the actual quality achieved in finishings and fittings varies considerably—more so for example than appears to be the case with schools or commercial buildings.

The extraordinary range of prices for a group of components in which there is considerably less scope for quantitative variation than in superstructure is shown in Fig. 9. But quality does not vary directly with price and, for example, an eleven-storey block with one of the lowest prices at 12*s.* 4*d.* has in fact an exceptionally good standard of finish both internally and externally.

In view of this and the fact that there are twelve other blocks with prices below 14*s.* it is reasonable to expect that finishings and fittings in high flats need cost no more than 14*s.* per sq. ft. gross.

HEATING AND PLUMBING

There is little variation in the provision of sanitary fittings in dwellings, but arrangements of soil and waste stacks differ considerably. The provision of pipe ducts at typical upper floor levels varies from three ducts per dwelling to one duct for two dwellings. It can generally be said that a few reasonably large ducts are preferable to a larger number of smaller ones.

The various installations for space and water heating together with plumbing and sanitary fittings are shown in Table XII, with their average prices. The prices for solid fuel and gas space heating include an estimated £70 for flues and fuel stores and £30 for flues respectively.

Ten blocks in rather special categories are not listed in Table XII; they include four having district heating, two having the Garchey refuse and waste system and two having individual solid fuel space heating with central hot water supply.

Heating by individual solid fuel appliances. In the majority of cases where solid fuel is used, a back-boiler is installed and is sometimes supplemented by an immersion heater in the hot water cylinder for summer use. This form of space and water heating, although usually the cheapest in running cost, has many disadvantages in high blocks, including the problems of fuel storage and ash disposal; the dirt and general wear and tear involved; delivery difficulties; increased fire risk; and the space, weight and complexity of flues. These disadvantages can be mitigated but unfortunately not eliminated by such developments as shunt flues on the one hand and trolleys for coalmen on the other. Fuel occupies a considerable amount of space and fuel stores appear in general to be rather small. In the majority of the blocks fuel stores are within the dwelling; in four cases they are on the landings, and in three cases at ground level.

It can be seen from Table XII that the average prices of all four non-central heating arrangements are broadly the same. It appears that £220 is a reasonable maximum per dwelling for heating and plumbing employing one of these alternatives; this figure has in fact been achieved or improved on in ten blocks in the sample.

Central heating. Central heating possesses many advantages but individual cost control of the heating, which is desirable, is not found in any of the sample blocks. A combination which provides individual control of water heating and running economy at the boiler house is that in which central space heating is provided for the winter months only and hot water is obtained from an electric immersion heater or balanced flue gas heater in each flat.

From the data available it would seem that prices per dwelling for heating and plumbing, including the central space heating system with individual hot water arrangements, should not exceed £300; and for systems including full central supply £360; that is to say increases of approximately £80 and £140 respectively over the various heating installations employing individual appliances only.

LIFTS

The prices for the installation of one lift in the various heights of blocks in the sample are given in Fig. 10. There is no significant variation in speeds involved, all of which are in the region of 100 ft. per minute. The great majority of lifts carry 8, and in six cases 10 persons. In twelve cases the capacity is 6, and in nine cases 4 persons. It is generally considered that all lifts should carry 8 persons. Even after allowing for differences in numbers of stops the prices vary more than would be expected. Some authorities have maintenance administration problems owing to the number of different manufacturers with whom they are concerned, and a natural desire for some standardisation of lifts has therefore developed.

From Fig. 10 it is clear that lift installations should not cost more than £2,000 in six-storey blocks with an increase of £200 for each additional storey. The desirable aim is to spread the cost of each lift over a reasonable number of dwellings and if

Table XII

Number of blocks	Space Heating	Water heating	Heating and plumbing per dwelling	
			Range	Average
28	Solid fuel appliance	Back boiler	£189–£302	£252
7	Solid fuel appliance	Gas or electricity	£220–£279	£250
6	Gas	Gas or electricity	£187–£309	£243
5	Electricity	Electricity or gas	£166–£338	£241
5	Central heating	Gas or electricity	£252–£390	£304
11	Central heating	Central	£276–£481	£390

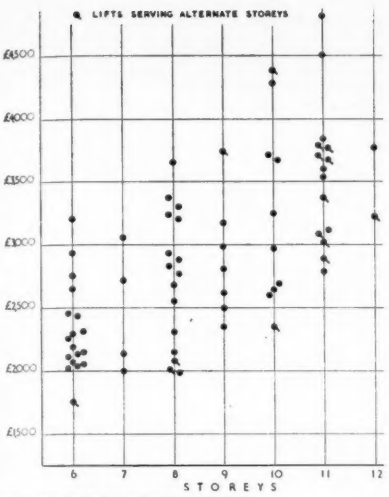


Fig. 10. Lift installation prices

possible to provide a choice of two. This is readily achieved with balcony access, as Fig. 4 shows, at prices between £50 and £100 per dwelling.

With staircase access and the provision of a choice of two lifts at a total price not exceeding £100 per dwelling, it is necessary to have at least six flats served per floor. With point blocks of restricted plan area this number may not always be easy to achieve and unless only one lift is provided the price per dwelling is almost certain to be over £100. In single-depth slab blocks having staircase access with one lift at intervals along their length, a price per flat in excess of £100 is again almost inevitable. With these exceptions however it would seem that a reasonable ceiling price for lifts in blocks up to twelve storeys could be set at £100 per dwelling.

CONCLUSIONS

In each of the sections of this report dealing with the various groups of components a price has been suggested as a reasonable target which has been achieved in a number of cases and need not normally be exceeded. It may be of interest to compare these figures with the existing averages shown in Table II. The target prices are: (1) Substructure, 3*s*. per sq. ft. gross; (2) Superstructure, 15*s*. per sq. ft. gross; (3) Finishes and fittings, 14*s*. per sq. ft. gross; (4) Heating and plumbing, £220 per dwelling (including solid fuel, gas or electric appliances); (5) Lifts, £100 per dwelling.

It was shown earlier that the ratio of 'other areas' to gross area is, on average, 21 per cent, but in 25 cases ratios below 18 per cent have been achieved and it is therefore reasonable to suppose that in general the net area can be at least 82 per cent of the gross area. In this case, the total for the first three items above of 32*s*. per sq. ft. gross is equivalent to a figure of 39*s*. per sq. ft. net.

The most commonly built dwelling has an area of 680 sq. ft. At this size the total for the last two items above of £320 per dwelling is equivalent to 9*s*. per sq. ft. net.

It should therefore be possible to build an average-sized flat or maisonette in a six- to twelve-storey block for 48*s*. per sq. ft. net, excluding site works (50*s*. if central space heating is included). This target is equivalent to £1,630 for a dwelling of 680 sq. ft. floor area or about £540 per room.

It is of interest to note that the figure of 48*s*. per sq. ft. net is only about 25 per cent greater than the price of two-storey housing in the London area. Although direct comparisons between the costs of houses and multi-storey flats can be misleading, there is no doubt that the gap between them could be considerably narrower than is at present commonly supposed.

Fig. 2 shows that the price of 48*s*. has in fact been improved on already in several of the lower blocks, and approached closely by some of the higher blocks, including several with central heating.

If prices in the range of 70*s*. per sq. ft. net could be reduced only to the cost of the average, a saving of £250 per dwelling would be made. If however the present average could be reduced to the target of 48*s*. a further saving of up to £450 per dwelling could be realised.

Although it may not always be easy to achieve economy in all respects it should normally be possible to achieve the target of 48*s*. per sq. ft. net for average-sized dwellings in high blocks without sacrificing good planning or amenity standards. With further advances in design and technique there can be no doubt that this figure of 48*s*. can in turn be substantially improved upon.

Acknowledgements. This paper deals with work which is part of the programme of the Building Research Board and appears by permission of the Director of Building Research.

Particular thanks are due to the many local authorities, architects, engineers, quantity surveyors, contractors and clerks of works without whose willing co-operation this work could never have been undertaken.

Practice Notes

Edited by Charles Woodward[*A*]

IN PARLIAMENT. Housing (Non-traditional). Financial responsibility for defects. In answer to a question asking him to state the exceptional circumstances in which he would accept financial responsibility for defects inherent in the design of types of non-traditional houses the construction of which his Department had authorised, the Minister of Housing and Local Government replied that such exceptional circumstances would arise only in the early stages of the introduction of a new type of non-traditional house. Otherwise local housing authorities were held to be fully responsible for the maintenance of their non-traditional no less than of their traditional houses. (28 February 1956.)

SURVEYS OF PREMISES FOR AN INTENDING PURCHASER. In recent years there have been many cases brought against architects and surveyors in respect of alleged negligence in reporting upon premises for a prospective purchaser. Notes of these cases have appeared in the JOURNAL from which it would appear that each case must depend on the exact purpose for which the report is required. If that is so then the professional man should ascertain clearly from his client at the outset the extent of the survey required. This will govern the fee to be charged, as what might be called a visual survey would necessarily be less costly than a detailed survey, involving an examination of hidden parts of the building which could only be done by opening up floors, exposing foundations, and the use of ladders. A thorough test of the drainage system and the electric installation together with tests of any hot water and heating system would also be necessary.

In many cases the premises to be surveyed are occupied, and it is obvious that unless a vendor will allow the detailed survey to be made the report must be so qualified as to lessen its value to the client. A visual report may say that no evidence of dry rot could be seen, but that was not conclusive evidence that dry rot did not exist. The drains may appear to be in accordance with modern requirements, but in the absence of a test no further opinion could be expressed. There may be no visual evidence of settlements in the premises, but shallow foundations in a clay soil might, in a dry season, lead to cracks appearing in the future. Unless such qualifications are made in the report a professional man is liable to a charge of alleged negligence if defects are found after the purchase of the premises has been completed.

It would appear that in deciding whether or not there has been negligence the Court will consider the purpose of the survey and the agreement between the parties as to the extent of the survey. The extent of a survey must depend on the willingness of a vendor to have the premises opened up, and if he withholds consent it would be prudent for the professional man before undertaking an inspection of the property to make it quite clear to his client that the report must necessarily be qualified. The client must then consider whether or not to rely on what the professional man can deduce from a visual inspection of the premises.

It is suggested that clear agreement between the parties at the outset might avoid litigation after a purchase has been completed, as in all cases of alleged negligence the Court will carefully consider the agreement and the terms of the report, having regard to the facts of the particular case.

Note. It is understood that Indemnity Policies now being issued by some agencies include the following exclusion clause:—

'This Policy not to pay for any Claim or proportion of Claim for loss resulting from, or in connection with Dry Rot, Wet Rot, Wood-worm and/or Beetle Infestation in any building in respect of which the Assured has carried out any Survey or Inspection, or for any consequential loss or damage arising therefrom, unless the Assured has made a report in writing of such Survey or Inspection, and has included therein a statement that the condition under which the Survey or Inspection was made did not enable him to reach any conclusion respecting the presence or absence of Dry Rot, Wet Rot, Wood-worm and/or Beetle Infestation, and that he does not accept responsibility for such; and further has drawn attention to the possibility of the non-apparent existence of the defects above referred to.'

ARCHITECTS REGISTRATION COUNCIL. In the Council's Annual Report for 1955 the following appears under the heading of 'Professional Conduct':—

'The Council have received an inquiry whether an architect may properly appear in an advertisement by television in which he would state his satisfaction with the services offered by the advertiser to the building industry in respect of certain specific installations. The advertiser has been informed that the Code of Conduct expressly prohibits an architect from recommending specific building materials in advertisements and that this prohibition would be equally applicable to recommendations of installations to be provided by a firm who serve the building industry.

'In connection with the R.I.B.A. Form of Contract, the Registration Council have been advised by learned Counsel that if an unregistered person or someone acting under his direction completes and submits for the signature of his client an R.I.B.A. Form of Contract in which he is named as the architect he will be committing an offence against Section 1 of the Architects Registration Act 1938 in that he would be practising or carrying on business under the title of "Architect".'

The Report states that less than 10 per cent of architects on the Register are recorded as subscribers to the funds of the Architects' Benevolent Society. Donations are urgently needed and the Council hope that every architect on receipt of the Report will send a contribution to the Society at 66 Portland Place, London, W.1.

REGIONAL JOINT CONSULTATIVE MACHINERY. It has been announced by the Joint Consultative Committee of Architects, Quantity Surveyors and Builders that regional joint consultative machinery on the lines of the national body is now active throughout the whole of England and Wales. (2 March 1956.)

BUILDING CONTRACTS—N.F.B.T.E. DECISION. Having considered the recent undertakings given by a number of producers of building materials to keep the prices of their products stable for certain fixed periods, the Council of the National Federation have decided to recommend to members that in respect of contracts up to £5,000 in total value, the duration of which would not exceed six months from the date of tender, the materials fluctuations clause should be omitted from Government contracts under Form CCC/Wks/1.

In view of this decision it is likely that the new limit will be operated in practice in respect of other contracts also. (2 March 1956.)

WAR DAMAGE COMMISSION. Deputy Commissioner Appointed. The War Damage Commission have appointed Mr. G. A. Coombe, M.C., Past President R.I.C.S., to be a Deputy Commissioner of War Damage in succession to Mr. S. Vyvian Hicks, Past President R.I.C.S., F.A.I., who has resigned. Mr. Coombe will be concerned mainly with cases in and around the London Area and the Home Counties.

MODEL FORM FOR SCAFFOLDING. Negotiations between the National Federation of Building Trades Employers and the National Association of Scaffolding Contractors have reached a successful conclusion and a model form of quotation and conditions for the hire, erection and dismantling of scaffolding has been agreed between these bodies.

The Council of the National Association of Scaffolding Contractors have undertaken to recommend members of the Association to submit quotations in accordance with this model form. Members of the Association will however continue to use their own forms when submitting quotations, but where this recommendation has been accepted the words 'as agreed between the National Federation of Building Trades Employers and the National Association of Scaffolding Contractors' will appear on their forms of quotation and conditions of contract. (28 March 1956.)

NATIONAL JOINT COUNCIL FOR THE BUILDING INDUSTRY. Building Wage Increase. At its meeting on 5 April the National Joint Council for the Building Industry, following Award No. 818 of the Industrial Disputes Tribunal, decided that the standard wage rates of building trades operatives should be increased by 2½*d.* per hour as from Monday 16 April 1956.

LAW CASES

Lynch v. Thorne. Court of Appeal. Whether implied warranty by builder that a new house in course of erection is fit for habitation. This case was an appeal by the builder from a judgment of the County Court Judge.

The builder, Mr. Thorne, was developing an estate in 1953 and entered into a contract with Mr. Lynch for the sale of a house in course of erection, only the walls having been built at that time. Mr. Lynch entered into occupation in October 1953.

The contract provided for the building of the house in accordance with a plan and specification attached to the contract. The house was built in accordance with the plan and the County Court Judge held that the material was good and the workmanship sound but awarded damages to Mr. Lynch because of dampness penetrating the exterior walls. The Judge found that a bedroom on the first floor was not fit for habitation.

The house was built with 9-in. solid walls and it was agreed that a 9-in. wall does let in dampness, depending on the situation of the house.

For Mr. Thorne it was submitted that in view of the express terms of the contract there was no room for an implied term that the house was fit for habitation. An implied warranty in any event could only be within the limits of the contract, namely that a house built in accordance with the plan and specification should be as reasonably fit for habitation as such a house could be.

For Mr. Lynch it was submitted that the circumstances made it obvious that he wanted a house fit for habitation and was relying on the skill and judgment of the builder to produce it. Mr. Thorne had not only put forward his skill as a builder but also as the designer and architect, because he produced both the plan and specification.

Giving judgment, the Court of Appeal said that because of the penetration of water one of the bedrooms could be said to be uninhabitable. The law has been well settled that on the sale of land with a house on it there was no warranty as to the habitability of the house, but where the house was in course of erection that principle did not apply. In such a case there was an implied covenant that the building should be habitable, but that must always yield to the express letter of the covenant. The County Court Judge found that Mr. Lynch relied on the builder's skill and judgment, but the Court of Appeal could not arrive at the same conclusion. Mr. Lynch had entered into a bargain which laid down the precise nature of the structure and materials, and there was no room for an implied covenant.

Mr. Thorne's appeal was accordingly allowed with costs. (THE ESTATES GAZETTE, 10 March 1956.) (1956. All England Law Reports. Vol. 1, p. 744.)

Uniproducts (Manchester) Ltd. v. Rose Furnishers Ltd. Landlord's liability to repair. The plaintiffs were lessees of premises under a lease for five years by which the lessor covenanted to keep the main structure of the premises in good and tenantable repair. Before the lease was granted the plaintiffs inspected the premises to see if they were suitable for their business.

After entering into possession, the floor of a storeroom on the ground floor of the premises collapsed into the basement and the plaintiff's manager, who was in the room at the time, was seriously injured. It was then discovered that the joists of the storeroom floor were badly affected by dry rot and were in an advanced state of decay. The plaintiffs, being under a legal liability to their manager, paid him £2,052 in settlement of a claim made by him.

The plaintiffs sought to recover the sum

of £2,052 from the lessor on the ground of breach of the covenant to repair. No express notice of the defect in the premises was ever given to the lessor by the plaintiffs and it was not established that the lessor had actual knowledge of the defect prior to the accident.

The Court held that whether or not the defect was in existence before the tenancy began, the lessor's obligation under the covenant to repair did not arise until the lessor had notice of the defect unless he had actual knowledge of it, and therefore since no express notice of the defect was given to the lessor by the plaintiffs and actual knowledge of the defect on the part of the lessor was not proved, the plaintiffs' claim failed. (1956. All England Law Reports, Vol. 10, p. 146.)

Philips v. Ward. Measure of Damages. This case was an appeal from the judgment of an Official Referee in respect of the damages due to the purchaser of a property where, after completion of the purchase, wood-worm and death-watch beetle were discovered in the woodwork of the premises. The purchase price was £25,000 and the Official Referee found that the cost of repair was £7,000. He valued the property in the state it was at the date of purchase at £21,000 and he awarded damages of £4,000 to the purchaser of the property. The purchaser appealed from this judgment to the Court of Appeal on the ground that £7,000 was the measure of damages, being the cost of putting the premises in repair, and that diminution in the value of the property was not the proper test.

The Court of Appeal dismissed the appeal, holding that the proper measure of damages was the amount of money to be paid to the purchaser to put him in as good a position as he would have been if the surveying contract had been properly fulfilled. If the purchaser had known of the state of the property he would either have refused to buy the house or would have bought it for its value in bad condition. The proper measure of damages was the difference between the value in the assumed good condition and the value in bad condition, which ought to have been reported. The cost of repair was not the proper test in the case of a considerable estate. The purchase price was not always affected by the cost of repair, for if this was substantial the purchaser could get considerable tax relief. If the purchaser recovered £7,000 damages from the surveyor, it would mean that he had got for £18,000 a house and land worth £21,000. The proper amount of damages was £4,000.

The purchaser's appeal was dismissed with costs. (THE ESTATES GAZETTE, 31 March 1956.)

Book Reviews

Toward Better School Design, by *William W. Caudill.* (An Architectural Record book.) 11¾ in. (xiii) + 271 pp. incl. pls. and other illus. New York: Dodge. [1954.] ($12.75.)

This book, by one of the leading American school architects, is not concerned with ready-made answers or standardised patterns. The broad, balanced and human approach to school design in which Caudill believes has much in common with what one hopes is becoming the English approach. It is not simple. Each project must be studied as a particular set of problems, human as well as technical, which can only be worked out by intricate investigation and hard thinking on the part of a considerable number of people. It is the architect's particular responsibility to give these specialised aspects their proper balance within a whole which is greater than its parts, and at the centre of the argument are the teachers and children who will inhabit the schools.

The School Boards who are responsible for the building of schools in America can be compared with the local education authorities in this country, but they are far more numerous, and each one consequently has only a small building programme. The total number of people concerned with new schools however is very large and represents a wide variety of interests. To them this book must be welcome, because many state departments of education in the U.S., unlike our Ministry of Education, give little constructive guidance on school building design.

The book starts rightly with the subject of children: 'If you are a school planner—architect, educator, school board official, or an interested citizen—take a good look at your clients.' The next sections discuss the three main and interdependent planning factors: education, environment and economy. Then comes a chapter of encouragement to planners to think of schools as integral parts of the neighbourhood and city, followed by a rapid survey of the problems of space arrangement, and finally a summary of the principles of a rational approach to planning. It is obviously only possible here to pick out a very few points from such a cycloramic view.

It is interesting and encouraging to see how there is the same struggle going on for cooperation between designers and clients as in England—and with what typical energy are the American architects and educators trying to understand each other! But might it not have been better if the group of teachers who 'had done scale drawings and worked on arrangements' had concentrated on telling the architect of the things they wanted to *do*, leaving him to translate these into design proposals for further discussion? This should be, after all, his special skill.

In both countries the revolution which has taken place in the education of younger children has been reflected in and stimulated by the new schools which have been built for them, and Caudill sees no reason why this freer, more imaginative thinking should not spread through the schools for older children. In England perhaps there has been more stimulus provided in this field by the introduction in the 1944 Act of the new secondary modern school; but in both countries we probably owe more than is sometimes remembered to the early pioneers—Carleton Washburne and Crow Island, individual teachers or designers who were often looked upon as 'odd', and the discussions of such a body as the International New Education Fellowship.

The chapter on environment is concerned with the 'envelope' from the point of view of 'pupil comfort'. In effect it discusses lighting, ventilation, noise and colour. And here perhaps a note of warning is needed for English readers, because the American solutions may not always be suitable to our conditions. Again, the American methods of assessing and comparing solutions are different from ours, and we cannot therefore make direct comparisons.

American standards of lighting are higher than in this country, but the stress laid on even distribution and the need for high reflectivity suggest that many American school interiors may be rather lifeless. In this search for uniformity reference is made to several devices, some of which must be very expensive, to control the variations of natural light.

In discussing colour, the author suggests that there is conflict between the demand made by lighting engineers for high reflectivity and the need for cheerfulness and gaiety in rooms to be inhabited by children. Recent English research and experience on this subject however show that the quantity of reflected light is determined by the average reflection factor of the whole interior, and that therefore relatively small areas of strong colour, while having little effect on the average reflection factor, have a very marked effect on the character of the space.

Another aspect of environment is discussed under the heading of 'division of space', and here also it is the stimulus of the approach which is valuable. The argument ranges from the principles of architectural design to fluidity of space and an analysis of the actual parts and equipment of a school. Several of the diagrams here seem to assume that secondary school classrooms will be in long rows, and of identical shape. Over here we are questioning whether this satisfies the increasingly varied and complex demands of teaching. One would have liked to hear more about the ways in which space is used for arts, crafts, music and drama. And will those concerned with the tremendous field of drama and movement really go on wanting school halls to be narrow and windowless, with fixed seats on a sloping floor? (One more characteristic of a good auditorium, the author adds, is beauty.)

The chapter on economy shows that Americans, like ourselves, do not have as much money to spend as they would like. They too must try to get the maximum educational value out of a cost limit for each school by means of a careful study (*a*) of the use of space and (*b*) of the structure. Possibly we have been forced by

circumstances to more drastic action. The American architect is simply told here to save a bit on everything. Does he, in fact, know where are the best places to look for savings, or how much he should spend on each element of the building? And has he yet found a satisfactory method of comparing costs of different schools? It will be interesting to see if the English way of cost analysis by elements will also prove to be the best for America, although over there it would mean that the architect, having no Q.S. to help him, would have to rely on the co-operation of the builder, who alone has the build-up of his tender figure.

American school planners, whatever their particular interests, must be very grateful for the work that Caudill is doing. He has a message which can well be heeded by those concerned with school planning everywhere.

MARY CROWLEY [*A*]
DAVID MEDD [*A*]

Histoire de l'Architecture Classique en France, by *Louis Hautecoeur*. Tome vi, La Restauration et le Gouvernement du Juillet 1815–1848. 12 in. x + 415 pp. incl. pls. and other illus. Paris: Picard. 1955. £4 15*s*.

Of all the weaknesses of French royalty, their passion for building may be regarded with the greatest indulgence, since it usually created a tremendous stimulus for the craftsmen of the period, and bequeathed a wealth of architectural masterpieces for future generations either to sack or contemplate according to their mood. Exile somewhat dampened the ardours of Louis XVIII and Charles X, but when Louis-Philippe was brought to power, he assumed the role of architectural patron with an enthusiasm, munificence and discrimination worthy of the dynasty he was so questionably perpetuating. Such discrimination was in itself no mean achievement in the first half of the 19th century. Probably no European monarch has ever had such a mania for building as Ludwig of Bavaria, yet his energies and wealth were almost entirely dissipated in endowing Munich with replicas of the monuments of Athens and Florence.

Louis-Philippe has so far received scant attention from architectural historians, largely because the work of his short reign has been overshadowed by that of Napoleon III. Yet even though the eclecticism of the period would render ludicrous the use of the term *style Louis-Philippe*, the stimulus given by this amiable and cultivated monarch justifies M. Hautecoeur in regarding his reign as an architectural entity. Brought to the throne after a long period of civil strife by a Parisian mob largely composed of unemployed building workmen, Louis-Philippe solved the problems of industrial unrest and conflicting political loyalties by putting the unemployed craftsmen to work restoring those monuments which recalled the common cultural heritage of the French people. In this he was a worthy successor of his great ancestor Henri IV, whose policy he so ably copied.

Being at one and the same time a Bourbon, a veteran of Napoleon's army and the son of a leader of the Revolution, Louis-Philippe could complete or repair the buildings of his predecessors without invidious distinctions or embarrassment, and in this pious work he was aided by two architects who had also navigated the perils of rapidly succeeding régimes with uncompromised loyalty: Percier and Fontaine. These architects may perhaps be criticised for having allowed the eclecticism of their politics to overflow into their art, but most of the work they executed during this period was confined to the decoration of interiors and the modification of historic palaces, where such eclecticism has a certain justification. Eclectic though they might be, however, it was an eclecticism confined within the strictest bounds of classical architecture. A certain amount of neo-Gothic was prevalent in this liberal period; church restorations, English fashions and the novels of Alexandre Dumas and Victor Hugo made this inevitable; but the 'Troubadour style' was never a serious threat to the Academy's authority, and Gothic dogmas caused few dissensions until the following reign, when Viollet-le-Duc's talents had fully matured, if not overripened. In the meantime, the leading architects could be classified according to three main groups: the Classical Rationalists, led by Labrouste; the Classical Polychromists, headed by Hittorf (one of the first architects to discover traces of colour on Greek temples); and the Classical Eclectics, mainly pupils of Percier, who were at this time showing a strong preference for the early Italian Renaissance. The Greek Revival, so prevalent at this time in America and the rest of Europe, hardly influenced France at all.

M. Hautecoeur's latest volume could not have been published at a more opportune moment. The more violent paroxysms of reaction against 19th-century architecture having by now subsided, this prolific period can be regarded less as a foil to display the excellences of machine-aged functionalism than as an autonomous architectural period deserving serious assessment in its own right. The danger now, when scholars are avidly turning their eyes towards this rich new field of interest, is that judgements will fly to opposite extremes, and indiscriminate enthusiasm will be lavished on every product of the period. M. Hautecoeur's new study should be a powerful check on any unbalanced assessment of an age in which the more important architectural critics showed little complacency with the products of their contemporaries.

M. Hautecoeur is as classical in his literary style as in his architectural sympathies, and his text is no less amusing and absorbing through being written with an elegant and epigrammatic precision. As usual, he manages to convey a wealth of stimulating and penetrating observations with an economy of words rare in this stentorian age. In his present work, he has achieved the difficult task of assessing critically but fairly the architecture of a period in French history torn by incertitudes, confused by archaeologists, unsettled by the continual appearance and disappearance of rival monarchs, and as yet unprovided with the new structural materials which were to give new forms to architecture once the iron industry had got beyond the stage of mere imitation. The masonry buildings of the Restoration and July Monarchy certainly have not the glamour of the engineering works of the period, but they represent more truly the architectural spirit of the age, a fact which the better-known history of the Modern Movement has tended to obscure. PETER COLLINS [*A*]

Alvar Aalto and Finnish Architecture, by *Eduard* and *Claudia Neuenschwander*. 10½ in. 192 pp. incl. pls. & other illus. Lond.: Archit. Press [1954]. £2 10*s*.

Printed in Switzerland and published in Zürich, New York, and London, this book examines the achievements of Alvar Aalto during three years (1950–1952) when Eduard Neuenschwander was closely associated with him, and also some of his earlier work. Useful enough as a record of a phase in Aalto's career, the authors, despite their pious intention, hardly succeed in conveying the stature of an architect of extraordinary capacity and originality. No doubt so great a man will be better served one day—at least one sincerely hopes so.

The best part of the book is the beginning, in which Finnish architectural tradition and background are well explained and some notable buildings, rarely mentioned elsewhere, such as the Cathedral of Tampere built half a century ago to the designs of Lars Sonck, are admirably illustrated.

The text is in German, French and (correct, but laboured) English. J. C. P.

Arkitekturens Formspråk (Architecture's Form Language), by *Erik Lundberg*. Vol. V: *The Renaissance in Italy 1420–1620*. 10 in. × 7¾ in. 532 pp. incl. 80 pls. & other illus. Stockholm: Nordisk Rotogravyr. [1954]. 54 Kr. (paper cover), 69 Kr. (cloth binding), 92 Kr. (vellum).

Here is another monumental volume in a monumental series written by a well-known Swedish art historian, archaeologist and architect, now in his 61st year, who has restored many old buildings in Sweden. The volume contains over 500 pages richly illustrated with 428 line drawings and photographs in the text and 80 full-page plates in photogravure at the end. It covers Florence and Rome in the 15th century; Renaissance developments outside Florence and Rome; Bramante and the High Renaissance; Sangallo, Michelangelo and the period 1520–45; Vignola and the period 1540–60; changes between 1570 and 1580; Maderna and the period 1590–1625; 16th-century development including gardens; Palladio and the High and Late Renaissance outside Rome and Florence; the theoretical works of Serlio; and, finally, a chapter on Lombardy and Genoa.

The first four volumes in this series were published between 1945 and 1952 and three further volumes of the final complete set

of ten are promised soon. It seems a pity that this tremendous work should be limited to the comparatively small Swedish readership of the world, even if the copious illustrations can give pleasure and information to everyone. As examples of book production these volumes provide an object-lesson in showing what can be done by a small nation having a total population of no more than that of London. In Sweden far closer co-operation and mutual aid exist between state authorities, private enterprise and creative individuals than in most other countries. The result is that the high cost of producing works of art and scholarship, such as a beautiful and lavish book, is not the first consideration if the project is considered worth doing as an end in itself rather than as a commercial venture. Then —as in the case of this sumptuous history of architecture—subsidies are always forthcoming from some suitable fund or other source. Far more patronage of this kind is needed in Great Britain, especially in the neglected sphere of book production at this time when publishers are finding it economically impossible to print noble books at a price the public can afford to pay.

The Swedish tradition, as followed in the case of these volumes of architectural history, of producing three kinds of binding for standard works—paper, cloth and half-hide (or vellum)—is also worth emulating.

ERIC DE MARÉ [4]

Hittite Art, by *Maurice Vieyra*. vi + 92 pp. incl. pls. and other illus. + (104) pls. and pp. of illus. 15*s*.

Furniture in Roman Britain, by *Joan Liversedge*. viii + 76 pp. incl. illus. + (48) pls. and pp. of illus. 10*s*. 6*d*.
Chapters in art *series* 26, 27; each 7¼ in. Tiranti. 1955.

Common to both these volumes in Tiranti's 'Chapters in Art' series are a competent index, an excellent cross-reference system and a bibliography.

The first offers a general historical essay, a map of Hittite sites and 122 photographs, each provided with a detailed explanatory note.

Mr. Vieyra is scrupulous in defining the characteristics of Hittite art, but assumes in his reader some understanding of the peculiar expression of deity present in the rock-carvings, and above all in the religious procession at Yazilikayah. Here the moving scene of King Tuthalyia in the embrace of the young god Shurrumma excites comparison with the psalmists' attributes of God as rock, strong castle, guide, etc. Yazilikayah sets the 'canon' for the representation of the Hittite divinity.

Miss Liversedge writes of the surviving fragments of Roman furniture and upholstery to be found in British county museums with the authority of an Honorary Keeper of the Cambridge University's Roman Collections. In spite of her profound knowledge, we are not able to fill in some important gaps in ours about the way in which the Roman settler lived; for example, whether he and his wife slept on a platform, or in the couch on which he reclined for his meal.

One regrets that the folding stool at Holborough, of which a fragment of the whole frame is shown, was not illustrated by its model in the Maidstone Museum rather than by the equivalent model of the Nijmegen stool.

Most of the 69 photographs are of course of sculptured reliefs, since very few examples of actual furniture have survived the centuries.

CECIL SEARLE [4]

Old European Cities: twenty-four 16th-century maps and texts from the **Civitates Orbis Terrarum** of *Georg Braun* and *Franz Hogenberg*, with an interpretation by *Arthur Hibbert* and a description by *Ruthardt Oehme* of early map-making techniques. 8¼ in. [142] pp. incl. (24) double pls., col'd. Thames & Hudson. [1572] [1955]. 15*s*.

The recent increased interest in towns and cities, here and abroad, will be further aroused by this handy reproduction, from an early book, of plates of 'perspectivised' plans of 24 cities of 17 different present countries of Europe, plus text only of Venice. They are reduced from hand-coloured copper engravings in the form of (apparently) line blocks and bright colour process—red roofs, orange walls, pink streets, blue rivers or seas and green surrounding fields, all with remarkable clarity. Edinburgh, with its exaggerated castle hill, and Elizabethan London ribbon-developing towards Westminster, represent Great Britain. Older and earlier city walls can sometimes be traced inside the later ones. The texts have been translated; the introductory chapters on the historical background, tracing the growth of each city from the map, and on medieval pictorial maps, describing their developing technique, are full of information of a more general kind. No index is, perhaps, called for.

H. V. M. R.

Icon and Idea. The function of art in the development of human consciousness, by *Herbert Read*. (Charles Eliot Norton lectures, 1953–54.) 9¼ in. 161 pp. + 88 pls. and pp. of illus. Faber. 1955. £2 2*s*.

Sir Herbert Read's views on the visual arts and architecture always command respect since they reflect the author's sensitive, serious and unwavering concern with physical environment as created by man. In the present book Sir Herbert considers the icon-making function and claims for it priority in time. The phases of this evolution lead from the vital image via the discovery of beauty to the constructive image. This expansion of consciousness is traced in a stimulating and provocative manner, but in the reviewer's opinion it seems to minimise unduly the significance of the social background against which the artist and architect work. It is true that if there was no icon-making faculty there would be no art, but this faculty operates within a social framework, and the personality of the individual patron or a group of patrons plays a vital part, as seen in Michelangelo's relations with Julius II, or in the report of the building of the nave of the Cathedral of Gerona by its Chapter in 1417. Facts of this nature qualify Sir Herbert Read's statements.

At the same time it would be short-sighted to see in art or architecture no more than the reflection of their period. Frequently great creative minds have a sense of the future and answer questions not adequately or consciously posed. This can be seen in the introspection characteristic of a Rembrandt or the social purpose revealed in Filarete or Ledoux. Such artists compensate for the prevalent 'inferior function' in the Jung sense and achieve a completeness in their work which transcends their period. It is this fact which explains the mysterious and recurrent phenomenon which we call 'Renaissance'.

HELEN ROSENAU

Georgian Cabinet-Makers, c. 1700–1800, by *Ralph Edwards* and *Margaret Jourdain*. 3rd ed. 11 in. × 8½ in. 247 pp. incl. (120) pls. and pp. of illus. + front. COUNTRY LIFE. 1955. £3 3*s*.

Nearly ten years have passed since the second edition of this authoritative book appeared, following hard upon the original wartime volume. Meanwhile a good deal of additional information, assembled before and since Miss Jourdain's death in 1951, has come to light and this is now incorporated in the present third and enlarged edition.

An impeccable production typical of the publishers, the book now contains particulars of the careers of about one hundred more or less prominent cabinet-makers in 18th-century England and a record of the furniture, much of it beautifully photographed, which can be reliably attributed to them individually. It is an appropriate companion to the revised edition of *The Dictionary of English Furniture* (also by Ralph Edwards) and to Sir Ambrose Heal's *The London Furniture Makers, 1660–1840*.

J. C. P.

The English Almshouse with some account of its predecessor, the medieval hospital, by *Walter H. Godfrey*. 10 in. 93 pp. incl. illus. + 48 pls. and pp. of illus. Faber & Faber. 1955. £1 16*s*.

This is a long and much-needed general work on the architecture of 'hospitals' and almshouses; Miss Rotha Clay's *Medieval Hospitals of England* (1909) chiefly dealt with their institutional aspect and J. M. Hobson's *Houses of Pity* (1926), though comprehensive, had no plans. The present attractively presented work deals with well over sixty examples in over thirty towns and villages all over England and several on the Continent; these date from the middle of the 12th to the mid-18th centuries. The continuous and very readable text, tracing social origins and architectural types, contains some fifty clear plans (many by the author) and other measured drawings; this is followed by over eighty good photographs, many of them full-page ones. A bibliography was thought impracticable; there is an exemplary index referring to text

and plate illustrations as well as to text and including a list of dedications and references from donors' names. A useful addition for a future reprint would be building dates in the captions, on R.C.H.M. lines.

The author makes it clear that of his 'extensive collection of material' only 'a mere fraction has been selected' for this book. Limits had obviously to be set for a semi-popular work; yet the lavish display that is included will astonish many by the abundance and variety of the buildings, and will arouse a hope that more of Mr. Godfrey's treasures may soon become available. The book will give opportune stimulus to the drive for the preservation of almshouses sponsored by the Council of British Archaeology. H. V. M. R.

Precast Concrete, by *Kurt Billig*. 8½ in. xvi + 341 pp. incl. illus. Macmillan. 1955. £1 12*s*.

In contrast with prestressed concrete, there is of course nothing new about precast (or prefabricated) concrete work, but the development of pre-stressing in the past few years has multiplied the uses of the precast method.

Dr. Kurt Billig, whose recent handbook on prestressed concrete has been rightly popular, has now collected into a companion volume a vast amount of information on precast concrete. It is undoubtedly useful to have the system fully reviewed in one detailed textbook, instead of having to pursue its many branches through innumerable articles in technical magazines.

Quality Budget Houses. A Treasury of 100 Architect-designed Houses from $5,000 to $20,000, by *Katherine Morrow Ford* and *Thomas H. Creighton*. 10¼ in. × 8¼ in. 224 pp. incl. pls. and other illus. (New York: Reinhold Pubg. Corp.; Lond.: Chapman & Hall. [1954.] £2.

It is nearly fifteen years since the late Professor and Mrs. Ford produced *The Modern House in America*, a book which first revealed the renaissance of domestic architecture taking place in the U.S.A. and the stimulus given to it by European émigrés. The Fords were themselves patrons of the new architecture and Walter Gropius built them a house near his own at Lincoln, Massachusetts.

It is hard to credit the great change that has taken place between the publication of *The Modern House in America* and *Quality Budget Houses*, during which period the United States, from being almost the least progressive nation architecturally speaking, has become the undisputed leader in the field, especially in domestic architecture. Perhaps *Quality Budget Houses* underlines the revolution that has taken place, for whereas the Fords' first book was concerned with the few modern houses in the United States, Mrs. Ford's and Mr. Creighton's new book is concerned with houses for the man in the American street—houses, that is to say, around £5,000.

The most interesting thing about these 100 houses is that any one of them could have been worthy of *The Modern House in America* of 1941. Some of these houses are by eminent architects, others are speculatively built. There are even some owner-built houses among them. All are of some interest and a high standard. They represent the outward and visible sign of the vast revolution in domestic living that has taken place in the States and is beginning to show its effects in England and elsewhere.

I have one bone to pick with Mrs. Ford: she never mentions Frank Lloyd Wright. Even if he had built no houses in the last decade (and he has; some well within her price bracket), such an omission would be unforgivable since he is unquestionably the father of the modern house, and his houses of the 1900s are the real forerunners of the houses Mrs. Ford and her collaborator illustrate. FELLO ATKINSON [*A*]

Housing Design, by *Eugene Henry Klaber*. 10¼ in. 247 pp. incl. pls. and other illus. New York: Reinhold; London: Chapman & Hall. [1954]. £3 8*s*.

An architect with long experience in American Government housing analyses with patience and thoroughness all the design problems likely to be met with in housing projects in the United States. The fact that none of the many schemes illustrated is foreign may prejudice the British reader against Mr. Klaber, since this is not a field in which European architects expect to derive much inspiration from America. But the open-minded will find a good deal of sensible information in his book which, they must not forget, was written mainly for home consumption, and in the particular hope of improving housing designs for the American people.

The author's style is crisp and to the point. He has a proper disrespect for fashionable architectural jargon and he shows few traces of that button-bright salesmanship technique which ruins so much transatlantic literature for us English.

Applications for Planning Payments, by *A. E. Telling* and *F. H. B. Layfield*. 10 in. xx + 313 pp. Butterworth. 1955. £1 18*s*. 6*d*.

An account of the Town and Country Planning Act 1954 can hardly avoid phraseology which, in the words of the authors, makes it 'obscure in meaning and repellent in form'. Their aim has been to explain the circumstances in which payments may now be made to owners of land adversely affected by land use control, including compensation for planning restrictions and for compulsory acquisition. The law is stated as at 1 March 1955.

Building Planning and Design Standards, by *Harold R. Sleeper*. 11¼ in. × 9¼ in. 331 pp. incl. illus. + endpaper lists. New York: John Wiley; Lond: Chapman & Hall [1955]. £4 16*s*.

Ramsey and Sleeper's well-established *Architectural Graphic Standards* is probably known to many British architects as a wonderfully reliable source for preliminary general data on most planning problems.

Building, Planning and Design Standards, a new venture, is the logical development of *Graphic Standards* but is more specific in intention. In it the essentials of 23 basic building types—from motels to churches—are closely analysed, and sufficiently detailed information is provided to enable a comprehensive programme to be prepared. Each section has its own bibliography, a particularly useful feature, as well as diagrams, charts, tables and, in some cases typical plans.

The New Architecture and the Bauhaus, by *Walter Gropius*. English trans. by *P. Morton Shand*. Reprint. 8 in. [110] pp. incl. 16 pls. Faber. 1935 (1955). 15*s*.

At a time when Professor Gropius has just honoured the Institute by his acceptance of the Royal Gold Medal, it is particularly appropriate that Faber's should have reissued Morton Shand's translation of *The New Architecture and the Bauhaus*. Strictly speaking this is not a new edition but simply a reprint of the first English version (including the late Frank Pick's introduction) which was published in 1935. It is none the worse for that and provides agreeable, instructive and nostalgic reading.

J. C. P.

Correspondence

ARCHITECT, MANUFACTURER AND B.S. 1311: 1955

The Editor

Sir,—I trust that the Council will give further consideration to their suggestion regarding trade publications, otherwise members may expect to receive letters such as the following:—

'Messrs. Dring, Pin & Gravel, S.R.I.B.A.,
Chartered Architects.

Dear Sir,

WOLLOW HOUSING ESTATE

We are in receipt of your drawings for the above, but have to inform you that they are of little value to us not being of the sizes given in B.S. 308 and B.S. 1192 and they won't fit on the foreman's desk in our site office. What's more, the designs don't conform with the Housing Manual and the window sizes are different from the ones given in B.S. 990. If your firm would only conform to the recognised regulations it would make our business much easier.

Please send your lad who measures, out to take back your drawings.

Yours faithfully,
(Signed) *P. Spike*,
Director.
for King, Post & Spike Ltd.
Registered Contractors.'

The fertile brains in the profession will be able to imagine what will happen if this 'cult' is allowed to develop.

Your faithfully,
HOWELL F. LEWIS [*Student*]

Notes and Notices

NOTICES

Special General Meeting, Tuesday 1 May 1956 at 6 p.m. A Special General Meeting will be held on Tuesday 1 May 1956 at 6 p.m. to confirm such resolutions as are passed at the Special General Meeting held on 17 April 1956 concerning the proposed revision of Bye-law 43 as set out on p. 212 of the March 1956 issue of the JOURNAL.

One Hundred and Eighteenth Annual General Meeting, Tuesday 1 May 1956. The One Hundred and Eighteenth Annual General Meeting will be held on Tuesday 1 May 1956 after the Special General Meeting referred to above, for the following purposes:—

To read the minutes of the Sixth General Meeting held on 10 April 1956; formally to admit new members attending for the first time since their election.

To receive the Annual Report of the Council and Committees for the official year 1955-56. (Copies of the Annual Report were sent to members on 17 April.) (*Note:* It will facilitate answers to questions if members will give the Secretary prior notice of any questions they may wish to ask.)

To nominate two members as Hon. Auditors for the ensuing year.

(Light refreshments will be provided before the meeting.)

Eighth General Meeting, Tuesday 15 May 1956 at 6 p.m. The Eighth General Meeting of the Session 1955–56 will be held on Tuesday 15 May 1956 at 6 p.m. for the following purpose:—

To read the Minutes of the One Hundred and Eighteenth Annual General Meeting held on 1 May 1956; formally to admit new members attending for the first time since their election.

Mr. Henry Morris, C.B.E., M.A.(Oxon.), M.A.(Cantab.) to read a paper on 'Architecture and the Local Community.'

(Light refreshments will be provided before the meeting.)

Session 1955–1956, Minutes VII. At the Fifth General Meeting of the Session 1955–1956, held on Tuesday 6 March 1956 at 6 p.m.

Mr. C. H. Aslin, C.B.E., President, in the Chair.

The meeting was attended by about 100 members and guests.

The Minutes of the Fourth General Meeting held on Tuesday 7 February 1956, having been published in the JOURNAL, were taken as read, confirmed and signed as correct.

The following members attending for the first time since their election were formally admitted by the President: *As Fellows:* Maurice Alexander, H. C. Boardman, Derek Buckler, D. J. Cameron, J. B. Denman, L. H. A. Fermaud, A. H. H. Jenkins, F. Evan Jones, C. W. Lowe, Donald MacPherson, H. L. Morgan, D. E. Morrison, P. W. J. Neale, W. J. Thrasher, D. C. Townsend, R. O. Vine. *As Associates:* I. L. Blundell, A. S. E. Bradley, E. H. G. Child, A. M. Clissold, A. H. Elliott, William Gillitt, P. D. Hume, J. R. B. Palmer, E. G. Pethybridge, E. H. W. Priefert, Stephen Redmayne, K. R. Rege, J. A. Snellgrove, A. M. Vaidya. *As Licentiates:* J. J. Hickie, G. W. Hill, T. H. S. Meakin, H. G. J. Stone, N. A. E. Wyatt.

Professor Stuart Piggott, F.B.A., F.S.A., having read a Paper on 'Ritual and Architecture in Megalithic Monuments', a discussion ensued and on the motion of Professor V. G. Childe, D.Litt., D.Sc., F.B.A., seconded by Mr. John D. Evans, a vote of thanks was passed to Professor Stuart Piggott by acclamation and was briefly responded to.

The proceedings closed at 7.28 p.m.

British Architects' Conference, Norwich, 30 May–2 June 1956. A cordial invitation is extended to all members and Students of the R.I.B.A., the Architectural Association and the Allied Societies to attend the Conference to be held at Norwich from 30 May to 2 June. Full details of the programme and the application form were enclosed with the February issue of the JOURNAL. Application forms should be completed and sent to the Secretary R.I.B.A. as soon as possible but in any case *not later than* 11 *May*.

British Railways will this year (without charge) reserve accommodation for members of the Conference on any of the undermentioned trains from Liverpool Street if they know in advance the number of members travelling. Members wishing to avail themselves of this facility must send the following information to the Secretary, R.I.B.A., not later than 11 May:—

(*a*) Time of train on which they will travel.
(*b*) Number of persons in the members' party.
(*c*) First or third class.

Members must obtain their own tickets for the journey in the normal way.

Trains from Liverpool Street to Norwich on Wednesday 30 *May*

(all have refreshment cars)

	a.m.	a.m.	p.m.	p.m.
Liverpool St. ..	9.30	10.30	12.30	3.30
Colchester ..	—	11.47	1.55	—
Ipswich	10.49	12.24	2.24	4.46
Norwich (Thorpe)	11.40	1.26	3.15	5.30

R.I.B.A. Kalendar. The 1956–57 issue of the Kalendar will be published in the autumn and the last day for receiving changes of address for inclusion in that issue will be 31 May. This date applies to *all* members and Students, both in the United Kingdom and overseas.

New Building Materials and Preparations. The attention of members is drawn to the fact that information in the records of the Building Research Station, Garston, Watford, Herts, is freely available to any member of the architectural profession, and architects would be well advised, when considering the use of new materials and preparations of which they have had no previous experience, to apply to the Director for any information he can impart regarding their properties and application.

CURRENT R.I.B.A. PUBLICATIONS

The following is a list of the main R.I.B.A. publications with their prices.

Agreements, Forms of

Form of Agreement for General Use between a Private Building Owner and an Architect or a Firm of Architects.

Form of Agreement for General Use between a Building Owner (being a Statutory Authority) and an Architect or a Firm of Architects.

Form of Agreement between a Local Authority and a Firm of Architects for Housing Work.

Form of Agreement between a Local Authority and a Firm of Architects for Multi-Storey Flats.

Form of Agreement between the Promoters and a Firm of Architects appointed as the Result of a Competition.

Price 6*d*. per form (inclusive of purchase tax). Postage 3*d*.

Architect and His Work, The

Price 6*d*. Postage 3*d*.

Before You Build. Free.

Certificates, Architects', Form Prepared by the Practice Committee

Copyright Book of 100 Certificates.
Price 17*s*. (inclusive of purchase tax). Postage 1*s*. 5*d*.

Conditions of Engagement and Scale of Professional Charges

Price 6*d*. Postage 3*d*.

Contract, Form of Agreement and Schedule of Conditions

For use with quantities: 1939 revised 1952. Copyright.

For use without quantities: 1939 revised 1952. Copyright.

Price 2*s*. 2*d*. per form (inclusive of purchase tax). Postage 4*d*.

Adapted for the use of Local Authorities, for use with quantities: 1939 revised 1952. Copyright.

Adapted for the use of Local Authorities, for use without quantities: 1939 revised 1952. Copyright.

Price 2*s*. 5½*d*. per form (inclusive of purchase tax). Postage 4*d*.

Fixed Fee Form of Prime Cost Contract for use in the repair of war-damaged property, 1946 revised 1955. Copyright.

Price 2*s*. 2*d*. (inclusive of purchase tax). Postage 4*d*.

Cost Plus Percentage Form of Prime Cost Contract for use in the repair of war-damaged property: 1946 revised 1955. Copyright.

Price 2*s*. 2*d*. (inclusive of purchase tax). Postage 4*d*.

Examination, Intermediate, Questions Set At

Price 1*s*. per examination. Postage 3*d*.

Examination, Professional Practice, Questions Set At

Price 6*d*. Postage 3*d*.

Examinations, Final and Special Final, Questions Set At

Price 1*s*. per examination. Postage 3*d*.

Forms of Articles of Pupilage

Copyright. Price 1*s*. 8*d*. (inclusive of purchase tax). Postage 3*d*.

Membership of the R.I.B.A.

Particulars of the Qualifications for Associateship.

Price 2*s*. 6*d*. Postage 3*d*.

Party Wall Notice Forms, for Use Under the London Building Act

Form A—Party Structures.

Form B—Party Fence Walls.

Form C—Intention to Build within Ten Feet

and at a lower level than the bottom of the foundations of adjoining Owner's Building.

Form D—Intention to build within Twenty Feet of the adjoining Owner's Independent Building and to a depth as defined in Section 50 (1)(b).

Form E—Party Walls and Party Fence Walls on line of Junction of adjoining lands.

Form F—Walls or Fence Walls on Building Owner's land with footings and foundations projecting into adjoining Owner's land.

Form G—Selection of Third Surveyor.

Price 7*d.* per form (inclusive of purchase tax). Postage 3*d.*

Prizes and Studentships

Price 2*s.* 6*d.* Postage 4*d.*

Tender, Form of, for use by Nominated Suppliers

Price 2*d.* per form. Postage 3*d.* 2*s.* per dozen post free).

COMPETITIONS

Manhattan Redevelopment: International Competition. The publishers of *U.S.A. Tomorrow* invite architects, city planners, engineers and all others identified with these or allied professions to submit schemes for the redevelopment of the mid-town area of Manhattan. *There is no undertaking that any award-winning entry will be used.*

Assessors: Mr. Charles Abrams, Professor Percival Goodman, Mr. Jose Luis Sert, Mr. William W. Wurster, Mr. Maurice E. H. Rotival.

Premiums: $5,000, $2,500, $1,500, $1,000.

Last day for submitting schemes: 1 June 1956. Conditions may be obtained on application to: 'U.S.A. Tomorrow', Manhattan Redevelopment Competition, 210 Fifth Avenue, New York 10, N.Y., U.S.A.

New National Opera House at Benelong Point, Sydney, Australia: International Competition. The Government of the State of New South Wales invite architects who are members of their respective architectural institutes in any country in the world to submit designs in competition for a proposed National Opera House, to be erected on Benelong Point, Sydney, Australia.

Assessors: Professor H. I. Ashworth, M.A.(Arch.), F.R.A.I.A. [*F*], Sydney; Mr. Cobden Parks, F.R.A.I.A. [*F*], Sydney; Dr. J. L. Martin, M.A. [*F*], London: Mr. Eero Saarinen, A.I.A., Michigan, U.S.A.

Premiums: £A5,000, £A2,000, £A1,000.

Last day for despatching designs: 3 December 1956.

Last day for questions: 12 noon, 15 May 1956.

Every intending competitor was required to register his name and address in writing with the Secretary of the Opera House Committee not later than 15 *March* 1956.

Conditions may be obtained on application to the Secretary of the Opera House Committee, c/o Department of Local Government, Bridge and Philip Streets, Sydney, Australia.

Deposit: £A10.

International Competition of Ideas Regarding the Surroundings of Cologne Cathedral. The City of Cologne invites planners to submit in competition schemes for the redevelopment of the area surrounding Cologne Cathedral.

Assessors: Herr Kelter, Cologne; Herr Riphahn, Cologne; Professor Hillebrecht, Hanover; Herr Steiner, Zürich; Professor Weyres, Cologne; Professor Baader, Bonn; Herr Pecks, Cologne; Professor Leibbrand, Zürich; Herr Schüssler, Cologne; Dr. Adenauer, Cologne.

Premiums: 20,000 DM, 14,000 DM, 10,000 DM, 6,000 DM.

The City of Cologne will also purchase 5 entries at 2,000 DM each.

Last day for despatching designs: 12 noon, 31 August 1956.

Competitors may send their entries through the diplomatic representatives of the German Federal Republic. Entries arriving after 14 September will not be considered.

Conditions may be obtained on application to Städtebauamt der Stadt Köln, Stadthaus, Gürzenichstrasse.

Deposit: 100 DM.

International Competitions. The following International Competitions are at present being considered by the International Union of Architects, who are negotiating the conditions with the promoters in each case.

(*a*) Competition for the construction of the Sanctuary of the Madonna delle Lacrime in Syracuse.

Promoters: the Working Committee for the Sanctuary of the Madonna delle Lacrime.

(*b*) Competition for a monument in New Delhi to commemorate the 2,500th anniversary of Buddha's Enlightenment.

Promoted by the Government of India.

In each case the Secretariat of the I.U.A. have examined the published conditions of the Competitions and found them to be generally unsatisfactory and not in accordance with the standard regulations for International Competitions approved by UNESCO (R.I.B.A. Kalendar, page 812) on the advice of the International Union of Architects. Member nations of the I.U.A. have accordingly been warned not to participate, but negotiations are taking place between the I.U.A. and the promoters with a view to bringing the published conditions into conformity with the standard regulations and a further note will be published as soon as the conditions are reported by the I.U.A. to be satisfactory.

BOARD OF ARCHITECTURAL EDUCATION

Examination Dates. The Final and Special Final Examinations will be held on the following dates: 6, 7, 8, 9, 11, 12 and 14/15 June 1956 (last day for receipt of forms of application was 12 April 1956).

For the *June 1956 examination only* the following time-table for *Part 2* will be in operation:—

B.1 (General Construction) Monday 11 June, 9.30–1.0.
D (Specification) Monday 11 June, 2.30–5.30.
B.2 (Theory of Structures) Tuesday 12 June, 9.30–12.30.
C (Hygiene) Tuesday 12 June, 2.0–4.30.

The examination will be held at the following centres: London, Manchester, Leeds, Newcastle, Edinburgh, Belfast.

The Submission of Testimonies of Study for the R.I.B.A. Intermediate Examination and the Qualifications in General Education required for the Probationership of the R.I.B.A. The Board of Architectural Education have approved a regulation to come into effect immediately that a candidate may not submit any Testimonies of Study in connection with the R.I.B.A. Intermediate examination until he can produce evidence of holding the qualifications in general education required for the Probationership of the R.I.B.A.

R.I.B.A. Final Examination. Distinction in Thesis. Thomas Crick (Rochester), who passed the R.I.B.A. Final Examination in December 1955, was awarded a mark of Distinction for his Thesis.

The R.I.B.A. Banister Fletcher Prize 1955. Malcolm Ian Braddock of 37 Northgate Avenue, Macclesfield, Cheshire, who passed the R.I.B.A. Intermediate Examination in November 1955, obtained the highest number of marks in the Intermediate Examinations held in 1955 and has therefore been awarded the Banister Fletcher Prize.

Mr. Braddock is 22 years of age and received his architectural training at The Regional College of Art, Manchester.

R.I.B.A. Ashpitel Prize 1955. Michael James Briggs [Student R.I.B.A.] of 17 Scholemoor Avenue, Lidget Green, Bradford 7, who passed the Final Examination in December 1955, obtained the highest number of marks in the examination held in 1955 and has therefore been awarded the Ashpitel Prize.

Mr. Briggs, who is 23 years of age and was elected a Student R.I.B.A. in February 1952, received his architectural training at the Regional College of Art, Bradford.

ALLIED SOCIETIES

Changes of Officers and Addresses

Essex, Cambridgeshire and Hertfordshire Society of Architects: Chelmsford and District Chapter. Chairman, S. G. Roff Marsh, M.T.P.I. [*F*]. Hon. Secretary, John Strong [*A*], 119–121 High Street, Witham, Essex.

Federation of Malaya Society of Architects. Hon. Secretary, G. Meehan [*A*], P.O. Box 64, Kuala Lumpur, Malaya.

Ontario Association of Architects. President, George Y. Masson, 26 Equity Chambers, Windsor, Ontario. Secretary, John D. Miller, 50 Park Road, Toronto, Ontario.

Royal Institute of Architects of Ireland. President, Gerald McNicholl. Hon. Secretary, Wilfrid Cantwell.

Essex, Cambridge and Hertfordshire Society of Architects, Southend-on-Sea Chapter. Annual Dinner and Dance. The annual dinner and dance of the Southend Chapter took place at the West Cliff Hotel, Southend, on Saturday 3 March. Among the guests were Mr. C. H. Aslin, C.B.E., President R.I.B.A. and Mrs. Aslin, and they, together with the President of the Essex, Cambridge and Hertfordshire Society Mr. C. I. Hobbis [*A*] and Mrs. Hobbis, and the Chairman of the Southend Chapter Mr. R. F. S. Fenton [*A*] and Mrs. Fenton, received members and guests. The Mayor and Mayoress of Southend were unfortunately prevented from attending by a prior engagement.

After the loyal toast Mr. Fenton proposed the toast of 'The County Borough of Southend-on-Sea'. Mr. P. F. Burridge [*F*], Borough Architect, proposed the toast of the R.I.B.A. and its President and spoke of the lead which had been given by Mr. Aslin in his capacity as County Architect of Hertfordshire in contemporary school design. The toast of 'Our Guests' was proposed by the Vice Chairman of the Chapter, Mr. J. M. Bion [*L*] and replied to by Mr. C. I. Hobbis.

On the following day, Sunday, visits were

arranged to various places of architectural and historic interest in the Borough, including the Mayor's Guest House, Southchurch Hall and Prittlewell Priory and Southend Airport.

Northamptonshire, Bedfordshire and Huntingdonshire Association of Architects. Annual Dinner and Dance. The Association's annual dinner and dance was held on Friday 23 March at the Stratton Secondary Modern School, Biggleswade (designed by the County Architect for Bedfordshire, Mr. S. V. Goodman [*F*]), by invitation of the Bedfordshire County Council. The Bedfordshire Branch were the hosts and the 280 guests were received by the President of the Northamptonshire, Bedfordshire and Huntingdonshire Association, Mr. F. C. Levitt [*L*], and Mrs. Levitt, and by Mr. F. Charles Saxon, Vice-President R.I.B.A., and Mrs. Saxon. The guests included Professor Sir Albert Richardson [*F*], President of the Royal Academy, and Lady Richardson; Sir Frederick Mander, Chairman of the Bedfordshire County Council, and Lady Mander; Mr. H. R. Blayney, M.A., Headmaster of the Stratton school; Mr. E. Steward Smith [*F*], President of the Berks, Bucks and Oxon Architectural Association; Mr. E. Holman [*F*], Vice-President of the Birmingham and Five Counties Architectural Association, and Mrs. Holman; the Mayor of Bedford and the Archdeacon of Bedford, the Venerable Basil T. Guy.

The toast of the R.I.B.A. and Allied Societies was proposed by Sir Frederick Mander, and Mr. Saxon and Mr. Levitt replied. Professor Sir Albert Richardson proposed the toast of the guests and the Archdeacon of Bedford and Mr. Blayney replied.

Sheffield, South Yorkshire and District Society of Architects and Surveyors. Annual Dinner and Dance. The Society's annual dinner and dance was held on Thursday 23 February at the Royal Victoria Hotel, Sheffield. Among the guests were Mr. C. H. Aslin, C.B.E., President R.I.B.A. and Mrs. Aslin, the Lord Mayor, Alderman J. Curtis, J.P., and Mrs. Curtis, the Master and Mistress Cutler, and the Presidents respectively of the West Yorkshire Society of Architects and the York and East Yorks Society and their Ladies.

After the President of the Sheffield, South Yorkshire and District Society, Mr. H. A. Hickson [*F*], had proposed the loyal toast, the Lord Mayor proposed the toast of 'The R.I.B.A. and its Allied Societies'. He referred to the plan for the development of the city and said it contained the possibility of transforming the city for generations to come. Not everyone was blessed with architectural appreciation and good taste, but taste grew with what it fed on. He regretted the uniformity of modern architecture and thought more research was wanted into the kind of homes people wanted.

Mr. Aslin, replying, agreed that there was a sameness in architecture throughout the world, brought about largely by improved communications. He thought architects were trying to find out what local authorities really wanted, and instanced his own work, where a committee adjudicated at the end of a job on its merits and demerits. Today architecture was a vastly more complex matter than in the past when traditional building methods were followed; but a house should be both good to look at and to live in, and he thought the present generation of architects were well on the way to achieving this.

Mr. J. A. Dempster [*F*], Chief Architect to the National Coal Board, North-Eastern Division, proposing the toast of 'The Guests', said he deplored any proposal to form an architects' trade union which would fix salaries at certain levels, as salaries should be proportionate to ability. The Master Cutler replied.

South Wales Institute of Architects. Annual Dinner and Dance. The South Wales Institute of Architects held their annual dinner-dance at the Park Hotel, Cardiff, on Thursday 8 March. Mr. W. Stephen Thomas [*A*], President, was in the chair and among the guests were Mr. C. H. Aslin, C.B.E., President R.I.B.A., and Mrs. Aslin, Lord Raglan, F.S.A., Lord Lieutenant of the County of Monmouthshire, the Lady Mayoress of Cardiff and Mr. Mervyn Jones, Chairman of the Wales Gas Board.

Lord Raglan proposed the principal toast of the evening and Mr. Aslin responded. Mr. D. Garbutt Walton [*F*], Regional Architect, Welsh Regional Hospital Board, proposed the toast of the guests and the Lady Mayoress and Mr. Mervyn Jones replied.

There were over 200 dinner guests and an additional forty attended the dance.

Hampshire and Isle of Wight Architectural Association: Isle of Wight Chapter. Members visiting the Isle of Wight during the summer may like to know that the Isle of Wight Chapter of the Hampshire and Isle of Wight Architectural Association hold an informal luncheon meeting on the first Thursday of each month (August excepted) at the Wheatsheaf Hotel, Newport, between 1 and 2.15 p.m. The Chapter extends a warm welcome to any visiting member, though a day's notice of the intended visit would be appreciated to simplify catering arrangements. Hon. Secretary of the Chapter is Mr. E. C. Sweetman [*A*], 16 Bath Road, Cowes.

GENERAL NOTES

Shapes and Sizes of Technical Literature. Postcards for use by members asking manufacturers to produce technical literature in accordance with B.S. 1311: 1955 are available from the Secretary, R.I.B.A., on application.

Notes from the Minutes of the Council

MEETING HELD 6 MARCH 1956

1. Appointments of R.I.B.A. Representatives. (a) *British Standards Institution: Building Divisional Council.* Thomas Mitchell [*A*] in place of R. N. Wakelin [*F*]. (b) *R.I.B.A. Architecture Bronze Medal: Nottingham, Derby and Lincoln Society of Architects: Jury to consider Award.* J. H. Lloyd Owen [*A*], President, Leicestershire and Rutland Society of Architects. (c) *Building Research Station: Factory Research Group sponsored by Midland Regional Board for Industry: Advisory Committee.* Harry Weedon [*F*]. (d) *B.S.I. Committees:* BMB/—Bituminous Products Industry Standards Committee, K. C. Evans [*A*]. BMB/6—Pitch Fibre Drainpipes, J. S. Wyatt [*A*]. PEB/—Builders' Plant and Equipment, F. H. Heaven [*A*] (each in place of E. H. Sadler [*A*]—resigned). MEE/34/4—Heating Boilers, D. W. Aldred [*F*] (new appointment).

2. Honours. The Council's congratulations were conveyed to Sir Patrick Abercrombie [*F*] on being made an officer of the Legion of Honour and to Mr. W. W. Hopkins [*A*] on being made a Companion of the Imperial Service Order. The Council also congratulated Mr. Brian O'Rorke [*F*] on his election as a Royal Academician and Mr. W. H. Kininmonth [*F*] on his election as a Royal Scottish Academician.

3. Chairman of the Allied Societies' Conference. It was reported that the Allied Societies' Conference had appointed Mr. Harold Conolly [*F*] as Chairman for the Session 1956–1957. Mr. Conolly thus becomes a Vice-President R.I.B.A. for the Session under the provisions of Bye-law 28 (i) (*b*).

4. R.I.B.A. Architecture Bronze Medal: The Liverpool Architectural Society. The Secretary reported that the jury entrusted with the award of the R.I.B.A. Architecture Bronze Medal in the area of the Liverpool Architectural Society for the three-year period ending 31 December 1953 had made their award in favour of the Denbighshire County Technical College at Wrexham, designed by Messrs. Saxon, Smith & Partners (F. Charles Saxon [*F*] and R. Vernon Smith [*A*]). Formal approval was given to this award.

5. The Federation of Malaya Society of Architects. Approval was given to an amendment to Rule 9 of the rules of the Federation of Malaya Society of Architects to provide for membership of the Society by persons qualified by passing the examination set by the Architects Registration Board of the Federation.

6. Hemel Hempstead New Town: Exhibition. On the recommendation of the Public Relations Committee it was agreed to lend the Henry Florence Hall for an exhibition showing the contribution made by both official and private architects towards the building of the New Town. The exhibition will be shown from 22 May to 30 May 1956.

7. Principles regarding the Undertaking of Work for Private Clients by Official Architectural Departments of Local Authorities. The Council considered the principles involved in the undertaking of work for private clients by the official architectural departments of local authorities. It was the opinion of the Council that each case must be judged on its individual merits, but in general it would only be considered appropriate for an official architectural department of a local authority to undertake work where that local authority had a financial or operational responsibility for the completed work, or where a substantial proportion of the cost of the work was chargeable against public funds through the local authority.

8. Membership. The following members were elected: as Fellows 38; as Associates 274; as Licentiates 16.

9. Students. 45 Probationers were elected as Students.

10. Applications for Election. Applications for election were approved as follows: *Election 10 April* 1956—as Fellows 54; as Associates 74; as Licentiates 24. *Election 19 June* 1956 (*Overseas Candidates*)—as Fellows 10; as Associates 17.

11. Application for Reinstatement. The following application was approved: as Licentiate, Douglas William Cooper.

12. Resignations. The following resignations were accepted with regret: John Wilson [*A*] (Serial No. 12580), George Percival Bridges [*L*].

13. Applications for Transfer to Retired Members' Class under Bye-law 15. The following applications were approved: as Retired Fellows—Raymond Nairn Butler, Harold Ewart Matthews: as Retired Associate—George Edward Clay.

14. Obituary. The Secretary reported with regret the death of the following members: Sir Walter Peacock, K.C.V.O. [*Hon. A*], Frederick William Beech [*F*], Edmund B. Clarke [*F*], Frederick George Bruce Hawkins [*F*], Cecil Howard Lay [*F*], Philip Clive Newcombe [*F*], William Salmond [*F*], Philip Armstrong Tilden [*F*], Thomas Arthur Sladdin [*Retd. F*], John Daniel Swanston [*Retd. F*], Alan Leslie Snow [*A*], William Needham Spence [*A*], John Sowerby Milner [*Retd. A*], Vivian Edward Young [*Retd. A*], James Moore [*L*], William Ernest Newby Potts [*L*], Charles S. Righton [*Retd. L*].

By resolution of the Council the sympathy and condolences of the Royal Institute have been conveyed to their relatives.

Obituaries

William Arnold Mitchell [*L*] died on 28 October 1955, aged 67.

Mr. Mitchell was formerly Borough Surveyor of Stalybridge and Glossop. He was articled to the late Mr. Grieves of Buxton and later went as Assistant Surveyor at Mirfield, Yorkshire, afterwards holding similar positions in Slough and Buxton.

He volunteered in 1915 for military service and served in France and Salonica, where he was severely wounded. He returned for a time after the war to Buxton, and was later appointed Borough Surveyor of Glossop, then of Stalybridge. He stayed in Stalybridge for 19 years, until his retirement. During the Second World War he was in charge of the Civil Defence organisation in Stalybridge.

Mr. Mitchell had lifelong connections with the Methodist Church and was particularly active in youth work.

Harold Frederick Walker, M.B.E. [*F*], died on 18 November 1955, aged 63.

We are indebted to Mr. H. E. Bell [*A*] for the following account of Mr. Walker's career:

'A pupil of the late Sir Aston Webb, he worked for a time during this period on alterations to Buckingham Palace; he became an Associate in 1915. Immediately after qualifying he volunteered for service with the Royal Flying Corps as a pilot and saw much action in France until being severely wounded. He was awarded the M.B.E., mentioned in despatches and attained the rank of Captain.

'After the war he worked for a time with the Air Ministry and Home Office and started in practice in Felixstowe in 1921. He had a very varied practice and his more prominent works included the General Post Office, extensions to the Cottage Hospital, the amusement park, several church extensions and church halls and many shops, licensed premises and houses.

'Mr. Walker was a Founder Member and Past President of the Felixstowe Rotary Club and a keen supporter of the local branch of the Royal Air Force Association.'

William Illingworth [*F*], Past President of the West Yorkshire Society of Architects, died on 25 October 1955, aged 80.

Mr. Illingworth served his articles with Mr. John Waugh, a civil engineer, and worked for a time in the office of the City Engineer and Surveyor to the Bradford Corporation. In 1927 he left to start his own practice. He became a Licentiate in 1912 and a Fellow in 1925.

Mr. Illingworth specialised in cinemas. He built among others the Gaumont (formerly New Victoria), Bradford, believed to be the largest cinema in the provinces. He also built Congregational churches at York, Wombwell and Huddersfield, a Methodist church at Undercliffe, Bradford, a wholesale bakery in Gain Lane, Bradford, factory extensions and private houses.

Besides being at one time President of the West Yorkshire Society of Architects and representing that Society on the Council, Mr. Illingworth was the founder Chairman of the Bradford branch. From 1940 to 1941 he was Lord Mayor of Bradford.

Mr. Illingworth's son, Mr. W. D. Illingworth, F.R.I.C.S. [*L*], joined him in partnership in 1934, and Mr. K. J. Grisdale [*A*] also became a partner in October 1955. They now carry on the practice of Illingworth, Son & Grisdale in Bradford.

Samuel Armstrong Hurst Mackey [*F*] died on 22 August 1955, aged 72.

Mr. Mackey served his articles in Manchester and practised first in Liverpool and later in Warrington. He began practice in approximately 1922. While at Liverpool he was in partnership with Mr. Kenmure but at Warrington practised alone.

His principal architectural works include Warrington Corporation gas and electricity showrooms; an extension to their works for the Sankey Green Wire Weaving Co.; additional buildings for Messrs. Thomas Locker; Orford Church Hall, Warrington, and reredos, pulpit and Lady Chapel of St. Paul's Church, Warrington.

Mr. Mackey served throughout the 1914–18 war, being discharged in October 1918 as no longer physically fit for war service.

Fiske Kimball [*H.C.M., U.S.A.*] died on 14 August 1955.

Mr. Kimball had been Director of the Philadelphia Museum of Art since 1925. His architectural works included the McIntire amphitheatre, gymnasium and apartments for the University of Virginia and the restoration of a number of important American houses, among them 'Monticello', the home of Thomas Jefferson in Charlottesville and the Robert E. Lee mansion, Stratford, Virginia. He had been architect to New York University since 1924. He held a number of honorary positions in the cultural life of the U.S.A. and served on the editorial boards of a number of publications concerned with the fine arts and architecture. He was for instance in charge of the American section of *Allgemeines Kunsterler Lexicon* from 1920 to 1926. He had held a number of professorships in the fine arts and architecture at American universities and was the author of a number of literary works, including *Thomas Jefferson, Architect; A History of Architecture* (with G. H. Edgell); *Domestic Architecture of the American Colonies; American Architecture; The Creation of the Rococo;* and *Great Masterpieces of Painting in America* (with L. Venturi).

Frederic Glynn Gilling [*F*] died on 8 September 1955, aged 82.

Mr. Gilling practised for a short period in his early days in Liverpool, but after the 1914–18 war went to Sydney, Australia, and practised there for the rest of his life. From 1923 to 1928 he was in partnership with Mr. Howard Joseland, and the partnership was known as Joseland and Gilling. In 1948 Mr. R. A. Gilling [*A*] joined the firm, and in 1951 Mr. D. L. Gilling [*A*], and they now carry on the practice, which is a general one and has included hospitals (St. Luke's, Lady Gowrie and Burnside Presbyterian), Burnside Homes for the Murdoch School, war memorial chapel, dining hall and quadrangle for the Scots College, and a number of factories—all in Sydney. Mr. Gilling was the author of *Domestic Architecture in New South Wales.*

Frederick Taylor [*Retd. F*], died on 22 July 1955, aged 81.

Mr. Taylor studied at the Architectural Association School of Architecture and practised in Aylesbury, Buckinghamshire, where he designed the war memorial in the market square, the grammar school (won in open competition), a wing of the Royal Bucks hospital, and a municipal housing scheme after the first world war at Stoke Mandeville.

Mr. Taylor was a former Borough Councillor and was for many years chairman of the Aylesbury Literary Institution Club. He was a keen golfer and—in his early days—cricketer. He was an active Freemason and was at one time Worshipful Master of the Aylesbury Lodge.

Douglas Willerton Richardson [*A*] died on 18 February 1955, aged 48.

Mr. Richardson studied at the Crystal Palace School of Engineering and at King's College, London University, and was for a time with Messrs. Dorman Long & Co. Ltd. He was elected an Associate of the Royal Institute in 1940. He held posts successively with Poplar Borough Council, Devonport Dockyard, Mersey Docks and Harbour Board, Swansea Borough Council and St. Helens Borough Council—where he was Chief Architect. Here he was responsible for the crematorium, and both at St. Helens and Swansea he planned housing estates besides designing various local public buildings. In 1932 he exhibited a cathedral design in the Royal Academy.

George Flett [*A*] died of tuberculosis on 14 December 1955, aged 45.

Mr. Flett qualified at the Aberdeen School of Architecture, Robert Gordon's Technical College, and held posts as assistant with various firms until the outbreak of war, in London, Aberdeen and Colombo, Ceylon. He was senior architect with Messrs. Newberry & Fowler at the time of the erection of the building in Portland Place for the General Nursing Council for England and Wales.

In 1940 Mr. Flett joined the Scots Guards, was commissioned in the R.A. and transferred to the R.E., attaining the rank of Major. He served until 1945. In 1946 it became apparent that he had contracted tuberculosis.

Mr. Flett had been unable to do any regular work for some time, but three weeks before his death he was working at home on an entry for the competition for a new Legislative Council Building, Uganda.

Robert Wemyss [*Retd. L*] died in November 1955.

Mr. Wemyss was for a time in the office of the late Sir John Burnet in Glasgow and while there is thought to have been responsible for the design of the stations on the West Highland railway. He afterwards practised in Glasgow and later in Helensburgh, but the details of his work are not known.

Edward Hamilton Bloomfield [*A*] died on 30 December 1955, aged 57.

Mr. Bloomfield, who had been Deputy Director of Housing, Liverpool, since 1949,

trained at Manchester School of Art, Liverpool University, and at Glasgow School of Architecture. After varied experience with private firms in Glasgow and London covering a wide range of buildings he entered the service of Liverpool Corporation in 1923, in the Land Steward and Surveyor's Department. In 1938 he transferred to the Architectural and Housing Department, being appointed Principal Architect, Redevelopment, in 1944.

Mr. Bloomfield was wholly responsible for the design of all the buildings at Speke Airport and also for the Harold Davies and William Roberts modern swimming baths, and was in control under first Sir Lancelot Keay and later Dr. Ronald Bradbury of the section dealing with the development of Speke and Kirkby as well as the proposals for housing redevelopment in the central area of Liverpool.

Alfred Rowland Conder [*F*] died on 1 December 1955, aged 75.

Mr. Conder was educated at Mill Hill School, and served his articles in the office of his father, Alfred Conder [*F*]. He was also for a time in the offices of Sir Aston Webb and John Belcher. In about 1903 he began private practice in London and practised successively from Bedford Row, Cecile Park, N.8, and at Totteridge. From 1930 to 1939 he was Temporary Deputy Architect and Surveyor for Special Duties in the office of the Commissioners of Crown Lands and from 1940 to 1952 assessor for the War Damage Commission.

Jack Francis Hennessy [*F*] died on 4 September 1955, aged 68.

Mr. Hennessy was born in Sydney, Australia, where his father had gone from Leeds to settle, and practised in that city after studying at the technical college and university there and after a period as assistant in San Francisco, New York and Philadelphia and after travelling in England and the Continent. He entered into partnership with his father in Sydney in 1911. The firm is known today as Hennessy, Hennessy & Co.

Among the work carried out by the firm were a number of church works, including designs for the completion of the southern end of St. Mary's Cathedral and crypt; the completion of St. Stephen's Cathedral, Brisbane, and the design of the Holy Name Cathedral, also of that city; additions to Geelong Cathedral; designs for the completion of St. Joseph's Cathedral, Rockhampton; and designs for Cairns Cathedral and St. Peter's Cathedral, Armidale. Other buildings selected from a long list were the University of Queensland, St. Lucia (still under construction), premises for the Colonial Mutual Life Assurance Society Ltd. in Australia and New Zealand, South Africa and Birmingham (England), also for the Prudential Assurance Co. Ltd. in Sydney and Wellington, Mackay Mater hospital, a radio transmitting station at Doonside, N.S.W., and a radio receiving station at Bringelly, N.S.W.

Mr. Hennessy was the author of articles on town planning and city development in the Brisbane press. He was an Associate Member of the Institute of Engineers and a Fellow of the Royal Society of Arts, of the Town and Country Planning Association and of the Royal Society for the Promotion of Health.

Donald Whatmore Bell [*A*] died on 28 October 1955 at the unhappily early age of 33.

Mr. Bell studied at the Belfast College of Technology and was elected Associate R.I.B.A. in 1948. In 1949 he began private practice in Belfast. Although he carried out a considerable amount of traditional building for individual clients his main interest was in 'contemporary' and institutional work. Among his buildings were the Monarch laundry, Belfast, the Walpamur building in Rosemary Street and the Throne primary and Larkfield intermediate schools, both for County Antrim Education Authority. Larkfield School is being completed on site by Mr. G. J. F. Long [*A*], Mr. Bell's chief assistant, who is taking over the practice.

Aneurin Foulkes-Jones [*L*] died on 4 November 1955, aged 67.

Mr. Foulkes-Jones served his articles in Oswestry and Birmingham. He began private practice at Dolgelley, in Merionethshire, in 1935 and moved to Llangollen and Wrexham in 1945. Among Mr. Foulkes-Jones' works were a wool factory and warehouse at Dinas Mawddwy for Y Gymdeithas Wlan Ltd., offices and warehouse for the Horticultural and Botanical Association Ltd. at Llangollen, a new wing to the Miners' Institute at Wrexham, a creamery at Rhydymain, near Dolgelley, and housing schemes for Dolgelley and Bala U.D.C.'s and for Edeyrnion R.D.C. For a time he was Senior Town Planning Assistant to Dewsbury and Lytham St. Anne's.

Robert Bennett [*Retd. F*] died on 3 January 1956, aged 78.

Mr. Bennett served his articles with Sir Raymond Unwin and Barry Parker and went with them to work on the project of Letchworth Garden City. He remained with them until about 1904, when he set up his own practice in partnership with Mr. Wilson Bidwell with whom he worked for 40 years. Most of their work was done in Letchworth, beginning when the creation of the first garden city seemed to most people to be the wild dream of a few enthusiasts. Besides Letchworth Council offices, Broadway Cinema, Midland Bank and blocks of shops, Mr. Bennett was responsible for groups of cottages in thirty villages in Bedfordshire for Hitchin Rural District Council and also for the Queen Street improvement scheme in Hitchin.

Mr. Bennett was elected Associate in 1903 and Fellow in 1931; he retired in 1945.

Mr. Hugh Bidwell [*A*] now carries on the practice.

Albert Edward Lees [*F*] died on 10 March 1955, aged 67.

Mr. Lees served his articles with the firm of Benjamin Harlow Butters, in Nottingham, and studied part time at University College, London University. He served in the First World War in the Durham Light Infantry and in 1919 joined the London firm of Trehearne & Norman (now Trehearne and Norman, Preston and Partners), becoming a partner in 1931.

Mr. Lees' chief work was flats and offices. Among those on which he worked before the 1939 war were Phillimore Court, Kensington High Street; Melton Court, South Kensington; Hanway House, Red Lion Square; Tavis House, Tavistock Square, and Keysign House, Oxford Street. After the war he was responsible for the major war damage claims and for rebuilding on behalf of the London County Freehold & Leasehold Properties Ltd., in all about forty blocks of flats. Among these were Park Mansions, Montague Mansions (off Baker Street), and St. John's Wood Court. Also included in his post-war work were Century House, King Street (St. James'), and help on the preliminary planning of St. Bridget's House, Bridewell Place; Gateway House, Cannon Street; and Minster House, Arthur Street—still under construction.

The practice will continue from Windsor House, Kingsway, London.

Geoffrey Hubert Fairweather [*F*]. Following the obituary notice published in the February JOURNAL, Mr. W. N. B. George [*A*], partner in the firm of Pite Son & Fairweather, has sent us the following personal notes about the late Mr. Fairweather. He writes:

'Shortly before the war Geoffrey Fairweather joined the Territorial Army as a gunner, subsequently transferring to the Royal Engineers in which he was commissioned in 1940. He served throughout the war in the Middle East and in Europe and was mentioned in despatches. On demobilisation he rejoined the firm of which his father was then the senior partner and was himself made a partner in 1946.

'Geoffrey Fairweather was a man of great personal charm and integrity and had a wide circle of friends both inside and outside the profession. He was extremely thorough in everything he did and was impatient of carelessness and incompetence in others. These qualities were recognised and respected by everyone with whom he came into contact and in this way he greatly resembled his father for whom he had a profound affection and admiration.

'His interests were not only confined to his professional activities, for he was a games player of no mean ability and played cricket, hockey and rugby football with distinction. It was tragic that the life which he led with so much energy should have been cut short by a prolonged illness which, however, he bore with characteristic fortitude.'

Members' Column

This column is reserved for notices of changes of address, partnership and partnerships vacant or wanted, practices for sale or wanted, office accommodation, and personal notices other than of posts wanted as salaried assistants for which the Institute's Employment Register is maintained.

APPOINTMENTS

Mr. B. J. Bull [*A*] has been appointed Assistant Provincial Architect, Ministry of Education, Imperial Ethiopian Government, P.O. Box 1654, Addis Ababa.

Mr. Dorian H. S. Prince [*A*] has been appointed Architect in Charge, City Engineer's Department, Wellington City Council, New Zealand. His address is P.O. Box 2199, Wellington, N.Z., and he will be pleased to receive trade catalogues.

PRACTICES AND PARTNERSHIPS

Mr. Thomas Anders [*L*] has taken into partnership **Mr. David J. Dalton** [*A*]. The practice will continue from 98/100 High Road, Ilford, under the style of **Anders and Dalton.**

Mr. Reginald Badger [*A*] has taken into partnership **Mr. Michael J. E. Harrison** [*A*] and the firm, formerly known as Edwin Earp and Badger, will now practise under the title of **Earp, Badger and Harrison** at Guild Chambers, Scholars Lane, Stratford-upon-Avon (as before), and also at 4 High Street, Evesham, where they will be pleased to receive trade samples, catalogues, etc.

Mr. David T. Brown [*A*] has begun practice at 2 Charlotte Street, Perth, Scotland (Perth 2077), where he will be pleased to receive trade catalogues, etc.

Mr. Anthony Cave-Browne-Cave, D.S.O. [*A*], has begun practice at 17 Greenhill Street, Stratford-upon-Avon (Stratford-upon-Avon 3209), and will be pleased to receive trade catalogues, etc.

Mr. H. Leonard Keeble, A.R.I.C.S. [*L*], has dissolved his partnership with the firm of George Baines and Syborn and all future correspondence should be addressed to him at 36 Brighton Road, Coulsdon, Surrey (Uplands 8326).

Mr. Arthur W. Kenyon, C.B.E., M.T.P.I. [*F*], and Mr. Peter B. Kenyon, A.M.I.C.E., A.M.T.P.I., hitherto practising as Arthur Kenyon, Architects and Consulting Engineers, have taken into partnership **Mr. Matthys Tauté**, M.C. [*A*], and the firm will in future be known as **Arthur W. Kenyon and Partners.**

Mr. C. A. Lomas [*A*] and **Mr. D. H. Pooley** [*A*] have relinquished their appointments with the Crawley Development Corporation and have entered into partnership. They will practise under the style of **Lomas and Pooley** at 39 Brighton Road, Crawley, Sussex, where they will be pleased to receive trade catalogues, etc.

Mr. George Lowe [*F*] has taken into partnership **Mr. Colin E. Rae** [*A*] and the practice will continue at 4 High Street, Croydon (Croydon 0660), under the style of **George Lowe and Partner.**

Mr. T. F. A. Manning [*A*] and **Mr. Hugh Clamp** [*A*], at present practising at 8 The Green, Richmond, Surrey, have entered into partnership. Mr. G. H. Blomfield [*A*] and Mr. A. R. Osborne [*A*] have become associates in the firm, which will be continued under the title of **Manning and Clamp** at the same address.

Mr. Peter Miller [*A*] and **Mr. William Tritton** [*A*] have entered into partnership and have taken over the practice of the late D. Adshead Grant [*F*]. The firm's name will be **Miller and Tritton** and the address will now be 33 Edith Grove, Chelsea, S.W.10 (FLAxman 4314).

Mr. Geoffrey J. Monro [*A*] of James M. Monro and Son has taken into partnership **Mr. John Forbes** [*A*], **Mr. I. D. Wilcockson** [*A*], **Mr. W. W Carruthers,** A.M.I.H.V.E., and **Mr. J. W. D. Kelly** [*L*], who have been on his staff for many years. The practice will be carried on under the style of **Monro and Partners** at 6 Spring Gardens, Cockspur Street, London, S.W.1; 32 Clarendon Road, Watford, Herts; 25 Woodside Place, Glasgow C.3; and 4 Castle Street, Birmingham 4.

Mr. Martin Priestman [*A*] has opened a practice at School Green, Datchworth, Herts (Knebworth 3051), where he will be pleased to receive trade catalogues, etc.

Mr. Francis Matthew Shea [*L*] has taken into partnership **Mr. Reginald G. Tulley** [*A*] and the firm, formerly known as Reeve, Reeve and Shea, will now practice under the title of **Francis M. Shea and Partners,** at 6 Cecil Square, Margate, Kent.

Mr. C. Hubert B. Smith [*A*] has taken into partnership **Mr. J. F. Mummery** [*L*]. They will continue to practise from 6A London Street, Basingstoke, and will be known as **Wallis and Smith.**

Mr. G. A. Halse [*A*] of The Hermitage, Vicarage Road, Sidmouth, having accepted an appointment with the Canadian Department of Public Works, the practice will be continued by **Mr. S. G. Smith** [*A*] from the same address. He will be pleased to receive trade catalogues, etc.

Mr. Robert Stephenson [*A*] has opened a practice at Great Northern Chambers, 1 Old Market Place, Grimsby, Lincs., where he will be pleased to receive trade catalogues, information sheets, etc.

Mr. James Stirling and **Mr. James Gowan** [*AA*] have entered into partnership and are practising at 37 York Terrace, Regent's Park, London, N.W.1 (WELbeck 9436), where they will be pleased to receive trade catalogues.

Mr. Jeffrey Owen Tarren [*A*] and **Mr. Peter M. Caller** [*A*] have entered into partnership under the style of **Tarren and Caller** and are practising from 24 Front Street, Sedgefield, Stockton-on-Tees, and from 46 Kenton Road, Gosforth, Newcastle upon Tyne, where they will be pleased to receive trade catalogues and samples.

The partnership between **Mr. C. F. Timothy** [*A*] and **Mr. John Lacey** [*A*] has been dissolved by mutual consent. Mr. Timothy will continue to practise at 1 Gower Street, W.C.1 (LANgham 5161).

Esther Yuen Todd and **John Comrie Todd** [*AA*], having now established their practice under the style of **Yuen and Todd** at 111 High Street, Kuala Lumpur, Malaya, will be pleased to receive trade catalogues.

Mrs. Mary D. Wales [*A*] has taken into partnership **Mr. Malcolm G. Riley** [*A*] (formerly of 34A North Street, Keighley) at 19 High Street, Skipton (Skipton 2012).

Mr. Bernard Wilson [*A*], at present practising at 55 Mount Road, Wallasey, has taken into partnership **Mr. Derek Roy Owen** and they will now practise under the title of **Bernard Wilson and Owen** at 67 Lord Street, Liverpool 2 (CENtral 5599). They will be pleased to receive trade catalogues and samples.

Messrs. Wornum and Playne announce the retirement of Mr. Grey Wornum [*F*] from the firm for reasons of health. **Mr. Edward Playne** [*F*] and **Mr. John Lacey** [*A*] are amalgamating practices under the name of **Playne and Lacey** and will practise at 19 Queen Anne's Gate, Westminster, S.W.1 (WHItehall 2552).

CHANGES OF ADDRESS

Mr. Herbert J. Austen [*F*] has changed his address to 17 Mountfield, Mountfield Gardens, Tunbridge Wells, Kent (Tunbridge Wells 1279).

The address of **Mr. John Bestley** [*A*] is now c/o Messrs. King, Cook and Dawson, 20 Brandon Street, Wellington, New Zealand.

Mr. Reginald Cave [*F*] has moved to 208 Banbury Road, Oxford. No telephone number is yet available.

Mr. A. Douglas [*A*] has changed his address to 184 Roxeth Green Avenue, Harrow, Middx.

The private address of **Mr. Geoffrey Mason Fuller** [*A*] is now 22A Clarendon Square, Leamington Spa, Warwickshire.

Mr. Eric Gomersall [*A*] is now at Standard Bank Buildings, 144 Smith Street, Durban, Natal, S. Africa.

Mr. Eric Edward Hardy and **Mrs. Anthea Evelyn Hardy** [*AA*] have moved to Flagmore House, Downley Common, nr. High Wycombe, Bucks.

Mr. C. Heathcote [*A*] has moved to 66 Lowther Road, Eaton Rise, Norwich.

Mr. A. J. Holtum [*A*] has moved to 'Eldon', 4 Folly Drive, Tupsley, Hereford.

Messrs. Norman and Dawbarn [*FF*] have moved their office to 7 Portland Place, W.1 (LANgham 8011).

Mr. R. E. Owen [*A*] has moved to 1 Birches Drive, Birches Lane, Kenilworth, Warwickshire.

The London office of Messrs. **W. H. Saunders and Son** [*A/L*] is now at 18 Sackville Street, W.1 (REGent 5580).

Mr. Brian Smith [*A*] has changed his address to 23 The Mall, Southgate, London, N.14 (PALmers Green 4076).

Mr. Raymond Gerald Smith [*A*], formerly of Wealdstone, Harrow, has changed his address to 18 St. John's Hill, London, S.W.11.

Mr. George H. Spencer [*A*] has moved from South Croydon to 'Clifton', Portobello Road, Macandrew Bay, Otago Peninsula, New Zealand, and will be pleased to receive trade catalogues.

PRACTICES AND PARTNERSHIPS WANTED AND AVAILABLE

Associate (35), A.A.Dipl., good all-round experience, car owner, seeks partnership or position leading thereto within a short period with an established firm, preferably in or near London or in the Reading area, though all other parts considered. Some capital available. Box 12, c/o Secretary, R.I.B.A.

Fellow, at present in practice, desires to obtain an interest or whole practice to add to interest. Preferably in south or west of England or Lake District. Box 25, c/o Secretary, R.I.B.A.

Associate (38), with small practice in Kent, seeks amalgamation with another practice or would consider disposal on suitable terms. Box 28, c/o Secretary, R.I.B.A.

Fellow (43) dissolving small partnership in London by mutual consent, requires small practice or partnership in S.E. London. Box 30, c/o Secretary, R.I.B.A.

WANTED AND FOR SALE

Wanted. A good set of 6-in. Stanley's pre-war instruments. State price required. Box 29, c/o Secretary, R.I.B.A.

Wanted. Second-hand double elephant plan chest. Box 31, c/o Secretary, R.I.B.A.

MISCELLANEOUS

Mr. F. C. Levitt [*L*] of Commerce House, Biggleswade, Beds, is revising his filing system and will be pleased to receive manufacturers' information providing that it is in accordance with B.S. 1311: 1955.

The Royal Institute of British Architects, as a body, is not responsible for statements made or opinions expressed in the JOURNAL.

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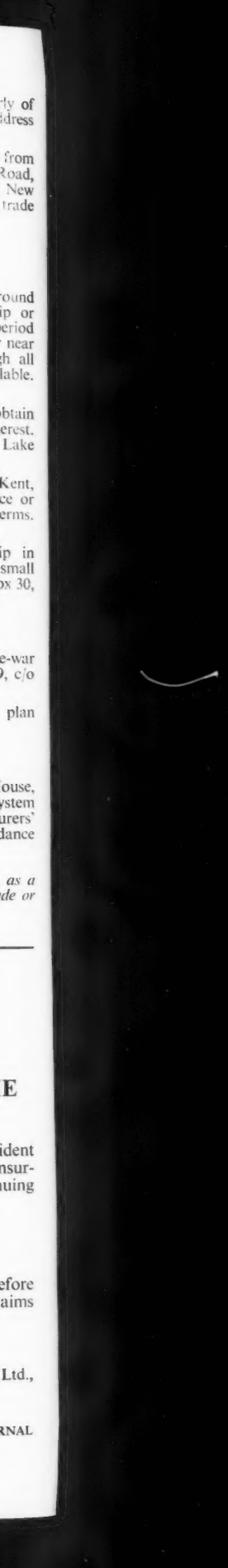
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